Parsing complex community interactions with regulators and non-governmental organizations in relation to local environmental management at Honeoye Lake, New York

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Abstract

This research sought to understand the complex interactions between governmental and non-governmental organizations engaged in assessing or managing the environmental issue of cyanobacterial blooms (commonly known as harmful algal blooms, or HABs) in Honeoye Lake, the second smallest Finger Lake in New York State. Honeoye Lake has a history of HABs that have been investigated for several years. However, while investigation of the ecological aspects of HABs has been ongoing, the intricate network of organizations that sometimes collaborate and sometimes compete to manage the lake was previously unstudied. Our research helps to clarify this complex network, which will prove important for future effective management. I found that a total of 24 stakeholder organizations interact in various ways, including financial, logistical, and managerial roles, with the majority of the interactions occurring at the state level. The New York State Department of Environmental Conservation interacts with the most stakeholder organizations involved with the HAB problem in Honeoye Lake. We did not find any significant correlation between: the number of interactions and hierarchical position; the number of interactions and physical distance; nor the physical distance and hierarchical distance between collaborating organizations." However, this project unveiled a fascinating web of interactions between entities surrounding a complex environmental issue that was previously not well understood.

Introduction

This work explores the complex entities, organizations, and stakeholders associated with Honeoye Lake engaged in discovering the causes of the noxious cyanobacterial blooms that occur annually, and their potential management solutions. Studies of these cyanobacterial blooms, also called Harmful Algal Blooms (hereafter HABs), have been ongoing, but increased in 2016 at the start of intensive lake sampling paired with modeling of lake processes and an investigation of social dynamics among stakeholders (Hatch Project 2016). Once the major causes of HABs in Honeoye Lake are known, careful management should begin promptly. Determining how to accomplish that management has been, and will continue to be a significant

challenge, especially given the complexity of the networks of people and organizations involved in Honeoye Lake HABs. The primary objective of this sociological study was to better understand how the network of agencies and organizations interact as they strive to address the HABs problem in Honeoye Lake. Understanding how these entities interact has provided insight into the challenges underlying successful management of Honeoye Lake.

An understanding of HABs in general is an essential component of understanding the cyanobacterial blooms that occur in Honeoye Lake. HABs occur when colonies of photosynthetic algae or cyanobacteria (phytoplankton) grow uncontrollably in bodies of water (NOAA 2016). Photosynthetic phytoplankton requires sunlight, slow moving water, and critical nutrients (i.e. nitrogen and phosphorus) to grow (EPA 2018). HABs occur naturally, but human activities that disturb ecosystems such as nutrient loading, pollution, food web alterations, introduced species, water flow modifications, and climate change can cause HABs to increase in frequency and intensity (NOAA 2016).

HABs have a variety of detrimental effects on the environment and surrounding human communities. These blooms can create “dead zones “in bodies of water, increase treatment costs for drinking water, negatively affect economies, and pose serious health risks to people and animals (Environmental Protection Agency 2018). The creation of dead zones in bodies of water impairs recreational activities and commercial fisheries. Dodds et al. (2009) estimated that the impairment of recreational activities and fisheries as a result of HABs could lead to losses of up to $1.16 billion in the United States in one year. Furthermore, they found that eutrophication causes biodiversity loss of aquatic macroinvertebrates, fish, and aquatic primary producers. In terms of water treatment, a range of physical and chemical methods are used to combat HABs in bodies of water that are used for water supply. Chemical methods include algaecides, copper sulfate, activated carbon, and aluminum sulfate. Physical methods include artificial destratification, mechanical mixing, hypolimnetic oxygenation, hypolimnetic siphoning, and inflow diversions. These treatments range in costs depending on the scope of the issue as well as the size and uses of the lake, but treatment costs can range from $17,000 per year to $4.3 million

per year (Hamilton et al. 2014).

Economic costs of HABs beyond water treatment and costs to the fishing industry include tourism and real estate losses (Environmental Protection Agency 2018). The Environmental Protection Agency (2018) estimates that the U.S. tourism industry loses close to $1 billion per year as a result of HABs. The tourism activities most affected are recreational fishing and boating activities, but there are additional losses in recreational swimming. Additionally, airborne nutrient pollution caused by HABs can impair visibility at national parks and other popular outdoor destinations (EPA 2018). Clean water can raise the value of a nearby home by up to 25%, consequently HABs negatively affect property values which causes real estate losses (Dodds et al. 2009; EPA 2018).

Perhaps the most serious consequence of HABs are their negative effects on human and animal health. The toxins in HABs can be ingested through food, inhaled aerosolized water, skin contact with water, and drinking water. The CDC (2017) cites neurotoxins that affect the nervous system, hepatotoxins that affect the liver, dermatoxins that affect the skin, and other toxins that affect the stomach and intestines as potential damages caused by the cyanotoxins some cyanobacteria can produce. Cyanobacteria can cause respiratory irritation, skin irritation, and liver and kidney toxicity (Fleming et al. 2002). The reported exposures to harmful algal blooms in the US between 2009 and 2010 caused a variety of gastrointestinal, dermatologic, eye and ear, neurologic, and respiratory health problems in addition to general issues such as headache, muscle aches, joint aches, fever, dizziness, and fatigue (Hilborn et al. 2014). HABs are especially dangerous to humans and animals because their toxins can be ingested through food, inhaled aerosolized water, skin contact with water, and drinking water. While cyanotoxins from HABs have not caused any human deaths in the United States, pets, livestock, and wildlife deaths have been reported throughout the United States and the world (Backer et al. 2015).

Focusing on the Honeoye Lake HABs provides important background for the understanding of the complex sociological interactions surrounding the management of cyanobacterial blooms.

Honeoye Lake is a 761 hectare lake that is used for swimming, fishing, and boating. The lake is not a public drinking water source, however a large number of residents around Honeoye take water from the lake for their private water systems to use for non-potable needs. The Honeoye Lake shoreline is contained within the towns of Richmond and Canadice, New York, but the lake's watershed encompasses six towns spanning two counties. Since 2012, there have been 84 confirmed HABs in Honeoye Lake, 14 of which had high toxins. The presence of these blooms has caused the closure of Sandy Bottom beach at the north end of the lake, the designated swimming area, every year from 2012 to 2017. This led to the loss of 104 beach days.

Honeoye Lake is a popular summer destination, with a variety of recreational attractions such as boating, swimming, fishing, waterskiing, and kayaking (New York State Department of Environmental Conservation 2018). Honeoye Lake is an attractive fishing destination because both open water and ice fishing are permitted for northern pike, walleye, brown trout, rainbow trout, lake trout, Atlantic salmon, and black bass (NYSDEC 2018). The land around the lake is also widely used for its picnic spots, playgrounds, athletic fields, camping grounds, hiking trails, and hunting areas. Honeoye Lake also supports a variety of ecological communities of fish, invertebrates and aquatic plants.

The HABs in Honeoye are primarily caused by excess nutrients in the lake. Some sources of phosphorus pollution that are typically seen causing HABs are septic systems and runoff from lawns, farm fields and other components of the watershed. Historically, there were farms in the watershed that had fertilizer runoff and there was a septic system used by residents of the watershed that leached into the lake, but these problems have since been mitigated. Therefore, the growing consensus in Honeoye is that the majority of the nutrients sustaining the blooms comes from sediments where nutrients were deposited by past external pollution. This phenomena is called internal loading or legacy pollution.

The primary objective of this project was to investigate the nature and diversity of the stakeholder, governmental, and non-governmental organizations already involved at Honeoye

Lake to gain a better understanding of who interacts with whom, in what way they collaborate, and what these entities are accomplishing and can accomplish. This effort is an essential prerequisite to a goal of managing HABs by providing insight into the technical feasibility, managerial capacity, and social acceptance of solutions to both the internal phosphorus loading problem, and legacy problems in general. Awareness of these two pertinent issues that affect lakes will inform communities and managers as they foster sustainability of freshwater systems. For example, once a lake is designated an "impaired water body" by the New York State Department of Environmental Conservation it is unclear how legacy pollutants within lake sediments can be managed. It is a problem compounded by the fact that there is currently no consensus as to whether the NYSDEC or the United States Environmental Protection Agency is the primary organization for management decisions at the lake. This issue inhibits effective management of Honeoye HABs, and therefore an understanding of these assets is critical.

The research reported here provides a tool for the Honeoye Lake community to engage in productive dialogue about perceived risks and benefits of centralized technologies for controlling HABs (Heberlein 2012). Community-based research is related to participatory asset mapping in that it is a partnership of students, faculty, and community members who collaboratively engage in research to solve a pressing community problem (Strand et al. 2003).

An understanding of the complex network of stakeholders engaged in this environmental issue was accomplished through participatory asset mapping, in which community members collectively provided information about their community's assets, including the status, condition, behavior, knowledge, or skills that a person, group, or entity possesses. These are located on a geographic map of the area of interest (Burns et al. 2012). This technique was chosen as a way to navigate the extraordinary array of entities engaged with the HABs problem at Honeoye Lake, as described by a retired engineer and Chair of the Honeoye Lake Watershed Task Force who also participates in limnological research targeted at understanding the causes of HABs in the lake (Hatch Project 2016).

This project began with interviewing two members of Honeoye Lake Watershed Task Force, to understand their experience with these entities – what has worked, what has not, and what is still in progress. Based on these assets, already identified by the chairman of the Honeoye Lake Watershed Task Force, and the information gained from interviewing him, the project continued by branching out along the asset map to meet with and interview the key players. Every subject interviewed allowed for more information to be gathered about the important people involved with HABs in Honeoye, including stakeholders outside of Honeoye Lake Watershed task Froce's contact group. Based on the information gathered from this variety of entities, I constructed a conceptual map of the linkages among them illustrating how working relationships are perceived from each side.

Participatory mapping is "the process of creating a tangible display of the people, places, and experiences that make up a community, through community members themselves identifying them on a map" (Burns et al. 2012). The *Participatory Asset Mapping* toolkit describes the creation of an actual geographic map of assets in space, whereas a complementary conceptual map shows linkages (as arrows superscripted with notes about the nature and direction of each interaction) describing the nature of interactions (Burns et al. 2012). Together in participatory asset mapping they provide a way to assess what members of the local community know and do not know about the key entities in lake management.

Combining the conceptual and the geographic participatory asset maps makes it possible to determine how important interactions among entities are compared with their geographic proximity. This provides a basis for further exploration of the governmental, non-governmental and stakeholder entities, their views, and managerial acceptance of centralized management of legacy internal nutrient loading as a cause of the HABs in Honeoye Lake.

Materials and Methods

Recruitment of interviewees took place via snowball sampling. Snowball sampling is a technique in which the first interviewee gives the name of another potential subject, then the next subject suggests third person for the interviewer to speak to, who in turn provides the contact information for a fourth interviewee, and the process continues (Vogt 1999). This strategy is useful for overcoming problems that are common when sampling is difficult to reach populations or convoluted networks of organizations and people (Atkinson and Flint 2001). This technique of sampling utilizes the social networks of this study's identified respondents to allow the set of potential contacts to expand continuously (Thomson 1997). The process of snowball sampling operates under the assumption that a link exists between the initial sample and others in the same target population which allows a series of referrals to be made within a circle of interacting organizations (Atkinson and Flint 2001). Snowball sampling was used as it was an informal method to reach the target population, and is useful in exploratory and qualitative studies, both of which apply to this project. This sampling technique is most frequently utilized to conduct qualitative research through interviews of participants (Atkinson and Flint 2001). This methodology can further be used to identify the people working on the ground who are essential in filling in knowledge gaps in a variety of sociological situations.

Snowball sampling has a variety of limitations such as problems of representativeness and sampling principles, finding respondents, and engaging residents as informal research assistants (Atkinson and Flint 2001). The quality of data collected via snowball sampling in terms of collection bias is the primary issue with this technique. Selection bias can color the initial contact chosen to begin the process of snowball sampling because the interview subjects are not randomly selected. Furthermore, the suggestions for next contacts of the first subject is dependent on that interviewee's subjective choices (Griffiths et al. 1993). In this experiment, the subjects often suggested organizations or people that had already been interviewed. Additionally, the number of new suggestions declined as the snowball sample was followed, indicating that the majority of relevant entities had been identified (Patton 1990).

The general themes that guided each individual interview were within the context of the environmental problems in Honeoye Lake, who interacts with whom, what has been accomplished thus far, and what needs to be accomplished. A list of questions was present at each interview (Figure 1) but these questions were not strictly adhered to if the subject spoke on a tangentially related topic.

For this project, I conducted and recorded eight interviews with subjects. These were carried out under Social Elements of Natural Resource and Environmental Management protocol #1101001927. The first subject was chosen based on input from an advisor, and then the rest of the interviewees were chosen through snowball sampling. The seven organizations from which people were interviewed were Honeoye Lake Watershed Task Force, Finger Lakes Community College, Ontario County Soil and Water Conservation District, Ontario County Planning Department, New York State Federation of Lakes Associations, Honeoye Valley Association, and the Nature Conservancy. Each interview revealed critical information about the organizations that interact in Honoye's HAB problem and how this environmental issue might be managed.

I transcribed each of the eight interviews and examined the information to extract which organizations interact, each organization's role, and the nature of interactions between pairs of organizations. Using this information, I categorized each interaction as mutual or one-sided. Using the categorization of relationships, a web of interactions was created for the entities concerned with Honeoye Lake HABs using double-headed arrows to depict mutual relationships and single-headed arrows to depict one-sided relationships (Figure 2). Relationships that were labelled "one-sided" were interactions in which one entity did not reciprocate in terms of research, funding, technical assistance, or other activity that its interaction partner was providing.

I also used the information from the interviews to assign a hierarchical position number to each organization based on the average physical distance of each of the categories of organizations from Honeoye Lake. Federal organizations were the farthest from Honeoye Lake, with an

average distance of 196.48 km. Therefore, federal organizations were assigned a hierarchical position number of 6, the most distant position from the lake. State organizations (161.63 km) were the second farthest from the lake and were assigned a hierarchical position number of 5. Regional organizations (78.12 km) were assigned a hierarchical position of 4. Non-governmental organizations and foundations (NGO/Foundation) (47.07 km) were assigned a position of 3, regional organizations (78.12 km) were assigned a position of 2, and local organizations (7.56 km) were an assigned position of 1.

Using these assigned numerical positions based on the average distance from the lake, a difference between hierarchical positions was calculated to determine if an organization was working "up" or "down." An organization working "up" occurs when an entity interacts with a stakeholder that has a higher relative hierarchical position, such as a regional organization interacting with a state organization. The relationships that involve working "up" have negative hierarchical position differences (a state organization with a hierarchical value of 5 subtracted from a regional entity with a hierarchical value of 4 gives a positional difference of -1). An organization working "down" is the opposite; a stakeholder interacts with another entity occupying a lower relative position, such as a federal organization working with a local organization. This relationship has a positive hierarchical positional difference (a local group with a hierarchical value of 1 subtracted from a federal organization with a hierarchical value of 6 gives a positional difference of 5).

The physical distance of each of the organizations from Honeoye Lake, was ascertained by drawing a straight line on a map between the coordinates of the two points, and using an application to calculate the distance in kilometers. I used hierarchical distance, as well as different relationships between the different types of distance, the number of connections, and other variables drawn from the information in the interviews to determine how the different organizations interact and what these interactions mean for the management of HABs at Honeoye Lake.

Interactions between organizations in the environmental management of Honeoye Lake were further analyzed using an ecological community connectance metric (Morin 1999). This was calculated using the number of links each organization had to the other entities in the network relative to the total number of possible links in the web. Irrespective of whether the relationship was mutual or one-sided, each relationship between two partners was counted as one interaction for each of them. This is because, even if the relationship is one-sided, the two organizations still interact. Thus, connectance is the proportion of possible links between entities that are present and ranges between 0 and 1. The connectance of the entire network was analyzed counting each mutual relationship and each one-sided relationship twice.

Results and Discussion

I identified 53 interactions between pairs of organizations or stakeholders. The majority (74%) of these relationships were mutual, with both entities giving its interacting partner some sort of support, whether it was technical, financial, logistical, or some other form. A map of the physical location of each of the stakeholders in relation to Honeoye Lake shows how spread out all of the organizations involved with the environmental management of the lake are (Figure 8). When compared to examples of asset maps in the Participatory Asset Mapping Toolkit, Honeoye does not have as many mapped entities involved, but this toolkit emphasizes that participatory asset mapping is an important tool for all different types of community issues (Burns et al. 2012).

The average number of interactions per organization was 4.6. The maximum number of interactions for any singular organization was 13 (NYSDEC) and the minimum was 1 (Ontario County Planning Department and Honeoye Lake Rotary Club) (Figure 2, Appendix 1). I found that the New York State Department of Environmental Conservation is the primary organization for management decisions concerning the lake. This result is noteworthy as previously there had been no consensus as to whether this responsibility fell onto the NY State Department of Environmental Conservation or the U.S. Environmental Protection Agency.

The 53 interactions documented occurred among 23 organizations, and given the number of organizations in any single interaction (i.e., two), leads to a combination calculation of 253 possible interactions. The connectance of the entire network web of interactions is 0.42, or 42% of the possible links in this network are present, which by ecological community standards is a relatively moderate value, though I did not have any comparable social network data with which to compare my results (Morin 1999).

The largest connectance values were those for the NY State Department of Environmental Conservation, the Ontario County Soil and Water Conservation District, and the Honeoye Lake Watershed Task Force (Figure 4). These organizations are at the state, county, and local level, respectively, which demonstrates that connectance is not strongly determined by the political level of the organization. In addition, there is not a large federal presence in the management of HABs at Honeoye Lake. The federal organizations that are present interact mostly in a permitting or funding capacity, as opposed to having a project-based function. One interesting finding is that in each category, one organization dominates the others in terms of connectance. These organizations are the Environmental Protection Agency (federal), the New York State Department of Environmental Conservation (state), Finger Lakes Community College (regional), the Nature Conservancy (NGO/foundation), Ontario County Soil and Water Conservation District (county), and Honeoye Lake Watershed Task Force (local). Furthermore, these organizations are also linked to each other more frequently than the organizations with lower connectance values. This discovery indicates that these six organizations are the key players in the environmental management of Honeoye Lake that collaborate and support each other financially and technically.

Using the positional difference between organizations and only counting one-sided relationships once, there is a similar number of organizations working “up” and organizations working “down” (36 up, 37 down) which is likely a result of the fact that most of the interactions are mutual. However, one interesting finding is that 21 of the relationships are between two entities at the same hierarchical level, demonstrating that there is a large degree of cooperation among

similar organizations. Analysis of each organization's hierarchical distance and number of interactions shows almost no correlation between the two ($r = 0.071$, not significant) which indicates that relationships in this network are not constrained by the entities' positions (Figure 5). I had hypothesized that a greater hierarchical distance from Honeoye Lake would limit the amount of interactions an organization was capable of, but this was not the case. Examining physical distance from Honeoye Lake, or the ground zero point, and the number of interactions shows almost no correlation between the two variables ($r = 0.017$, not significant) which demonstrates that the amount of interactions an entity has does not depend on physical distance (Figure 6). I had hypothesized, similarly, that the greater physical distance from Honeoye Lake would limit the amount of interactions an organization could engage in, but this also was not the case (Figure 6).

When comparing the physical distance between interacting organizations versus hierarchical distance between interacting organizations (Figure 7), there was a small statistically positive correlation ($r = 0.374$, $p < 0.05$). Figure 7 only includes half of the interactions between organizations, it excludes the interactions between organizations with a hierarchical distance of 0 (two organizations at the same level working together). Also, to avoid repeating interactions between the same two organizations, I excluded all of the interactions with negative hierarchical distance values. A graph of the negative hierarchical distances between organizations versus their physical distance is a mirror image of Figure 7, with a negative slope and a moderate negative correlation. Though the relationship between physical and hierarchical distance is significant, its relatively modest slope indicates that physical and hierarchical distances between interacting organizations does not prohibit collaboration on the environmental issues at Honeoye Lake.

Conclusions

The campus-community partnership that developed between Cornell University and the organizations involved in the environmental management of Honeoye Lake was a true

collaboration of students, faculty, and community members engaging in research to work towards solving a pressing issue in the Honeoye Lake community (Strand et al. 2003). Going forward, the focus for the future HABs intervention and management in the lake should focus on the key players in each of the six identified categories for technical support, financial assistance, and project management. These organizations are the most connected and accomplish the most in each of their respective hierarchical positions in the lake. Furthermore, new stakeholders that become involved with managing the HABs in Honeoye should be aware that hierarchy and physical distance from the lake do not prevent interactions between organizations. I hope that the creation of this database of knowledge of how these organizations involved in the environmental management of Honeoye accomplishes, whom they interact with, and the nature of each interaction is a useful tool for researchers in the future.

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Tables

Table 1: Quantitative variables describing the organizations involved in the environmental management of Honeoye Lake

Organization	Hierarchical Position	Number of Interactions	Physical Distance from Honeoye (km)	Coordinates
United States Army Corps of Engineers	6	2	116.33	42.933307, -78.903254
United States Fish and Wildlife Service	6	3	106.84	42.5878611, -76.2168472
Environmental Protection Agency	6	5	366.26	40.714632, -74.005153
New York State Department of Environmental Conservation	5	13	24.07	42.902572, -77.670441
New York State Department of Health	5	2	43.11	42.869148, -77.011211
New York State Federation of Lake Associations	5	7	317.27	43.420910, -73.712721
Citizen Scientist Lake Assessment Program	5	5	307.4	42.643893, -73.742227
Finger Lakes Lake Ontario Water Protection Alliance	5	3	116.31	43.341939, -76.345851
Finger Lakes HUB	4	2	114.68	
SUNY ESF	4	2	116.45	43.034463, -76.136935
Cornell University	4	2	88.95	42.4529209, -76.4809677
Finger Lakes Community College	4	6	26.48	42.867505, -77.242193
Finger Lakes Institute	4	2	44.05	42.860196, -76.982296
The Muller Family Foundation	3	3	45.47	43.133998, -77.493173
The Nature Conservancy	3	9	48.66	43.158527, -77.584620
Ontario County Soil and Water Conservation District	2	11	26.06	42.902279, -77.293000
Ontario County Planning Department	2	1	25.61	42.888773, -77.280353
Honeoye Lake Rotary Club	1	1	4.82	42.7686, -77.5054
Richmond Town Board	1	2	7.31	42.790290, -77.513552

Canadice Town Board	1	2	3.67	42.736782, -77.543512
Honeoye Lake Watershed Task Force	1	10	26.06	42.9029517, -77.2923704
Honeoye Valley Association	1	7	3.47	42.755573, -77.491905
Citizens of Honeoye Lake	1	6	0	42.725611, -77.507215

Table 2: Qualitative variables describing the organizations involved in the environmental management of Honeoye Lake

Organization	Level	Interactions	Address	Role in Environmental Management of Honeoye Lake
United States Army Corps of Engineers	Federal	I. Ontario County Soil and Water Conservation District II. New York State Department of Environmental Conservation	1176 Niagara Street, Buffalo, NY 14207	issues permits for projects in and around Honeoye Lake in conjunction with NYSDEC, do site visits for potential projects
United States Fish and Wildlife Service	Federal	I. The Nature Conservancy II. New York State Department of Environmental Conservation III. Ontario County Soil and Water Conservation District	4817 Luker Road, Cortland, NY 13045	requests and receives permits from NYSDEC for projects in and around Honeoye Lake, submit designs and proposals for projects, manages fish, wildlife, and natural habitats
Environmental Protection Agency	Federal	I. New York State Department of Environmental Conservation II. Honeoye Lake Watershed Task Force III. Finger Lakes HUB IV. New York State Federation of Lake Associations V. Ontario County Soil and Water Conservation District	290 Broadway, New York, NY 10007	supports several organizations with funding for projects and research concerning Honeoye, mandates NYSDEC to make watershed plans and oversee studies, consults with organizations about watershed models
New York State Department of Environmental Conservation	State	I. United States Fish and Wildlife Service II. United States Army Corps of Engineers III. Environmental Protection Agency IV. Ontario County Soil and Water Conservation District V. SUNY ESF VI. New York State Federation of Lake Associations VII. Citizen Scientist Lake Assessment Program VIII. Finger Lakes HUB IX. Finger Lakes Community College X. Honeoye Lake Watershed Task Force XI. Muller Family Foundation XII. The Nature Conservancy XIII. New York State Department of Health	6274 East Avon-Lima Road Avon, NY 14414	issues permits for projects in and around Honeoye Lake in conjunction with USACE, do site visits for potential projects, oversees studies, creates watershed plans, supports several organizations with funding for projects and research concerning Honeoye, runs and creates programs for management of the lake
New York State Department of Health	State	I. New York State Department of Environmental Conservation II. New York State Federation of Lake Associations	624 Pre Emption Road, Geneva, NY 14456	controls all the swimming beaches, shuts down the beaches when HABs are spotted, runs cooperative programs for the general public
New York State Federation of Lake Associations	State	I. New York State Department of Environmental II. Citizen Scientist Lake Assessment Program III. Finger Lakes Institute IV. Environmental Protection Agency V. New York State Department of health VI. Honeoye Valley Association VII. Citizens of Honeoye lake	48 Canada Street, Lake George, NY 12845	provides program support for HABs via CSLAP, does public education on lake and watershed management, requests funding for projects and research concerning Honeoye
Citizen Scientist Lake Assessment Program	State	I. Honeoye Lake Watershed Task Force II. New York State Department of Environmental Conservation	625 Broadway, Albany, NY 12233	a cooperative between NYSDEC and NYSFOLA to collect data for water quality monitoring,

		III. Finger Lakes Lake Ontario Water Protection Alliance IV. New York State Federation of Lake Associations V. Citizens of Honeoye Lake		employs the use of volunteers collect data for all 11 Finger Lakes, including Honeoye
Finger Lakes Lake Ontario Water Protection Alliance	State	I. Citizen Scientist Lake Assessment Program II. Ontario County Planning Department III. Citizens of Honeoye Lake	3105 NY-3, Fulton, NY 13069	funds the aquatic vegetation harvesting program, used to run the CSLAP program, funds public education workshops
Finger Lakes HUB	Regional	I. Environmental Protection Agency II. New York State Department of Environmental Conservation	615 Erie Boulevard West, Syracuse, NY 13204	created by the NYSDEC, fully staffed with scientists, act as link between other lake associations, develop 9 element plans which allows other organizations to get preferential funding for their projects
SUNY ESF	Regional	I. Honeoye Lake Watershed Task Force II. New York State Department of Environmental Conservation	1 Forestry Drive, Syracuse, NY 13210	tests algae samples for formal chlorophyll A, blue green algae chlorophyll A, green algae, diatoms, and levels of blue green algae toxins in lake water samples in Dr. Greg Boyer's laboratory, receives samples from HLWTF, communicates findings with NYSDEC
Cornell University	Regional	I. Honeoye Lake Watershed Task Force II. Finger Lakes Community College	616 Thurston Avenue, Ithaca, NY 14853	aids with discovery work and research to figure out when, where, and why HABs occur in the lake, collects samples with HLWTF
Finger Lakes Community College	Regional	I. Cornell University II. The Muller Family Foundation III. Honeoye Lake Watershed Task Force IV. New York State Department of Environmental Conservation V. The Nature Conservancy VI. Ontario County Soil and Water Conservation District	3325 Marvin Sands Drive, Canandaigua, NY 14424	professor of Finger Lakes Community College does research to figure out when, where, and why HABs occur in Honeoye Lake, advises HLWTF, does design and outreach for projects in and around the lake, participates in projects in and around the lake
Finger Lakes Institute	Regional	I. New York State Federation of Lake Associations II. Honeoye Lake Watershed Task Force	601 South Main Street, Geneva, NY 14456	analyzes lake samples from Honeoye
The Muller Family Foundation	NGO/ Foundation	I. New York State Department of Environmental Conservation II. The Nature Conservancy III. Finger Lakes Community College	1640 Penfield Road, Rochester, NY 14625	donated land and a field station that benefits several stakeholders, supports research efforts and education programming for students at FLCC
The Nature Conservancy	NGO/ Foundation	I. Citizens of Honeoye Lake II. New York State Department of Environmental Conservation III. Finger Lakes Community College IV. Ontario County Soil and Water Conservation District V. Honeoye Valley Association VI. Honeoye Lake Rotary Club VII. United States Fish and Wildlife Service VIII. Honeoye Lake Watershed Task Force	274 Goodman Street North, Rochester, NY 14607	does outreach events (biological inventories, plantings), donates land to other organizations for projects, purchases new land for projects and to prevent development, conducts research on avian species richness and amphibian species richness

		IX. The Muller Family Foundation		
Ontario County Soil and Water Conservation District	County	I. Finger Lakes Community College II. New York State Department of Environmental Conservation III. Honeoye Lake Watershed Task Force IV. Honeoye Valley Association V. United States Army Corps of Engineers VI. The Nature Conservancy VII. United States Fish and Wildlife Service VIII. Richmond Town Board IX. Canadice Town Board X. Environmental Protection Agency XI. Citizens of Honeoye Lake	480 North Main Street Canandaigua, NY 14424	director writes grants, works on and manage projects such as habitat enhancement, agricultural best management practices, educate the public, aids town boars with permitting process for projects and technical support, involved with several other stakeholders boards in presenting, voting, or advising
Ontario County Planning Department	County	I. Finger Lakes Lake Ontario Water Protection Alliance	20 Ontario St, Canandaigua, NY 14424	runs weed harvesting program in Honeoye Lake
Honeoye Lake Rotary Club	Local	I. The Nature Conservancy	P.O. Box 641 Honeoye, NY 14471	members live and recreate on the lake, communicate with TNC about ownership of land around the lake
Richmond Town Board	Local	I. Honeoye Valley Association II. Ontario County Soil and Water Conservation District	8690 Main Street, Honeoye, NY 14471	town supervisor Caroline Sauers, has legislative authority in the town, works to improve lake for all of the taxpayers who own properties in the area
Canadice Town Board	Local	I. Honeoye Valley Association II. Ontario County Soil and Water Conservation District	5949 Co Road 37, Springwater, NY 14560	town supervisor Kris Singer, has legislative authority in the town, works to improve lake for all of the taxpayers who own properties in the area
Honeoye Lake Watershed Task Force	Local	I. Honeoye Valley Association II. Finger Lakes Community College III. Finger Lakes Institute IV. Cornell University V. Citizen Scientist Lake Assessment Program VI. SUNY ESF VII. Environmental Protection Agency VIII. New York State Department of Environmental Conservation IX. Ontario County Soil and Water Conservation District X. The Nature Conservancy	480 North Main Street, Canandaigua, NY 14424	collects data on the lake weekly (digital photographs, samples), advises several organizations, coordinate grants and projects between other organizations, writes grant proposals, the first point of contact for other organizations when there is a problem in the lake
Honeoye Valley Association	Local	I. Citizens of Honeoye Lake II. Ontario County Soil and Water Conservation District III. Honeoye Lake Watershed Task Force IV. Richmond Town Board V. Canadice Town Board VI. New York State Federation of Lake Associations VII. The Nature Conservancy	P.O. Box 165 Honeoye, NY 14471	has around 180 members, anyone can be a member, publishes materials and holds symposiums for public education, facilitate involvement in projects between organizations, helps ge approval for projects in and around the lake, first point of contact for citizens when there is a problem in the lake
Citizens of Honeoye Lake	Local	I. The Nature Conservancy II. Honeoye Valley Association III. Citizen Scientist Lake Assessment Program	6150 E Lake Rd, Honeoye, NY 14471	make up all of the membership organizations dedicated to fixing HABs, live near and recreate in

		IV. New York State Federation of Lake Associations V. Finger Lakes Lake Ontario Water Protection Alliance VI. Ontario County Soil and Water Conservation District		the lake year round, volunteer for projects in and around the lake

Table 3: Data concerning the interactions between each organization and its partner organization

Organization	Physical Distance from Interacting Organizations (km)		Hierarchical Distance from Interacting Organizations (steps)		Nature of Interaction	
United States Army Corps of Engineers (USACE)	OCSWCD	129.74	OCSWCD	4	OCSWCD	mutual
	NYSDEC	99.60	NYSDEC	1	NYSDEC	mutual
United States Fish and Wildlife Service (USFAWS)	TNC	128.58	TNC	3	TNC	mutual
	NYSDEC	124.34	NYSDEC	1	NYSDEC	mutual
	OCSWCD	94.58	OCSWCD	4	OCSWCD	mutual
Environmental Protection Agency (EPA)	NYSDEC	389.13	NYSDEC	1	NYSDEC	mutual
	HLWTF	365.21	HLWTF	5	HLWTF	mutual
	Finger Lakes HUB	315.09	Finger Lakes HUB	2	Finger Lakes HUB	mutual
	NYSFOLA	301.89	NYSFOLA	1	NYSFOLA	one-sided
	OCSWCD	365.23	OCSWCD	4	OCSWCD	one-sided
New York State Department of Environmental Conservation (NYSDEC)	USFAWS	124.34	USFAWS	-1	USFAWS	mutual
	USACE	99.60	USACE	-1	USACE	mutual
	EPA	389.13	EPA	-1	EPA	mutual
	OCSWCD	30.79	OCSWCD	3	OCSWCD	mutual
	SUNY ESF	125.70	SUNY ESF	1	SUNY ESF	mutual
	NYSFOLA	326.13	NYSFOLA	0	NYSFOLA	mutual
	CSLAP	321.19	CSLAP	0	CSLAP	mutual
	Finger Lakes HUB	123.53	Finger Lakes HUB	1	Finger Lakes HUB	mutual
	FLCC	32.25	FLCC	1	FLCC	one-sided**
	HLWTF	30.79	HLWTF	4	HLWTF	mutual
			MFF	2	MFF	one-sided**

	MFF 29.50 TNC 29.30 NYSDOH 53.87	TNC 2 NYSDOH 0	TNC mutual NYSDOH mutual
New York State Department of Health (NYSDOH)	NYSDEC 53.87 NYSFOLA 274.54	NYSDEC 0 NYSFOLA 0	NYSDEC mutual NYSFOLA mutual
New York State Federation of Lake Associations (NYSFOLA)	NYSDEC 326.13 CSLAP 86.44 FLI 272.50 EPA 301.89 NYSDOH 274.54 HVA 315.66 Citizens 317.27	NYSDEC 0 CSLAP 0 FLI 1 EPA -1 NYSDOH 0 HVA 4 Citizens 4	NYSDEC mutual CSLAP mutual FLI mutual EPA one-sided** NYSDOH mutual HVA mutual Citizens one-sided
Citizen Scientist Lake Assessment Program (CSLAP)	HLWTF 291.90 NYSDEC 321.91 FLLOWPA 225.53 NYSFOLA 86.44 Citizens 307.40	HLWTF 4 NYSDEC 0 FLLOWPA 0 NYSFOLA 0 Citizens 4	HLWTF one-sided** NYSDEC mutual FLLOWPA mutual NYSFOLA mutual Citizens mutual
Finger Lakes Lake Ontario Water Protection Alliance (FLLOWPA)	CSLAP 225.53 OCPD 91.08 Citizens 116.31	CSLAP 0 OCPD 3 Citizens 4	CSLAP mutual OCPD one-sided Citizens mutual
Finger Lakes HUB	EPA 315.09	EPA -2	EPA mutual

	NYSDEC 123.53	NYSDEC -1	NYSDEC mutual
SUNY ESF	HLWTF 95.24 NYSDEC 125.70	HLWTF 3 NYSDEC -1	HLWTF mutual NYSDEC mutual
Cornell University	HLWTF 83.19 FLCC 77.46	HLWTF 3 FLCC 0	HLWTF mutual FLCC mutual
Finger Lakes Community College (FLCC)	Cornell University 77.46 MFF 36.06 HLWTF 5.76 NYSDEC 32.25 TNC 42.76 OCSWCD 5.77	Cornell University 0 MFF 1 HLWTF 3 NYSDEC -1 TNC 1 OCSWCD 2	Cornell University mutual MFF mutual HLWTF mutual NYSDEC one-sided TNC mutual OCSWCD mutual
Finger Lakes Institute (FLI)	NYSFOLA 272.50 HLWTF 25.73	NYSFOLA -1 HLWTF 3	NYSFOLA mutual HLWTF one-sided**
The Muller Family Foundation (MFF)	NYSDEC 29.50 TNC 7.88 FLCC 36.06	NYSDEC -2 TNC 0 FLCC -1	NYSDEC one-sided TNC one-sided FLCC mutual
The Nature Conservancy (TNC)	Citizens 48.66 NYSDEC 29.30 FLCC 42.76	Citizens 2 NYSDEC -2 FLCC -1	Citizens mutual NYSDEC mutual FLCC mutual

	OCSWCD 37.04 HVA 45.44 HLRC 43.88 USFAWS 128.58 HLWTF 37.04 MFF 7.88	OCSWCD 1 HVA 2 HLRC 2 USFAWS -3 HLWTF 2 MFF 0	OCSWCD mutual HVA mutual HLRC one-sided USFAWS mutual HLWTF mutual MFF one-sided**
Ontario County Soil and Water Conservation District (OCSWCD)	FLCC 5.77 NYSDEC 30.79 HLWTF 0 HVA 23.04 USACE 129.74 TNC 37.04 USFAWS 94.58 RTB 21.87 CTB 27.50 EPA 365.23 Citizens 26.06	FLCC -2 NYSDEC -3 HLWTF 1 HVA 1 USACE -4 TNC -1 USFAWS -4 RTB 1 CTB 1 EPA -4 Citizens 1	FLCC mutual NYSDEC mutual HLWTF mutual HVA mutual USACE mutual TNC mutual USFAWS mutual RTB one-sided CTB one-sided EPA one-sided** Citizens mutual
Ontario County Planning Department (OCPD)	FLLOWPA 91.08	FLLOWPA -3	FLLOWPA one-sided**
Honeoye Lake Rotary Club (HLRC)	TNC 43.88	TNC -2	TNC one-sided**
Richmond Town Board (RTB)	HVA 4.25 OCSWCD 21.87	HVA 0 OCSWCD -1	HVA one-sided** OCSWCD one-sided**
Canadice Town Board			

(CTB)	HVA 4.72 OCSWCD 27.50	HVA 0 OCSWCD -1	HVA one-sided** OCSWCD one-sided**
Honeoye Lake Watershed Task Force (HLWTF)	HVA 23.04 FLCC 5.76 FLI 25.73 Cornell University 83.19 CSLAP 291.20 SUNY ESF 95.24 EPA 365.21 NYSDEC 30.79 OCSWCD 0 TNC 37.04	HVA 0 FLCC -3 FLI -3 Cornell University -3 CSLAP -4 SUNY ESF -3 EPA -5 NYSDEC -4 OCSWCD -1 TNC -2	HVA mutual FLCC mutual FLI one-sided Cornell University mutual CSLAP one-sided SUNY ESF mutual EPA mutual NYSDEC mutual OCSWCD mutual TNC mutual
Honeoye Valley Association (HVA)	Citizens 3.47 OCSWCD 23.04 HLWTF 23.04 RTB 4.25 CTB 4.72 NYSFOLA 315.66 TNC 45.44	Citizens 0 OCSWCD -1 HLWTF 0 RTB 0 CTB 0 NYSFOLA -4 TNC -2	Citizens mutual OCSWCD mutual HLWTF mutual RTB one-sided CTB one-sided NYSFOLA mutual TNC mutual
Citizens of Honeoye Lake (Citizens)	TNC 48.66 HVA 3.47 CSLAP 307.40 NYSFOLA 317.27 FLLOWPA 116.31	TNC -2 HVA 0 CSLAP -4 NYSFOLA -4 FLLOWPA -4	TNC mutual HVA mutual CSLAP mutual NYSFOLA one-sided** FLLOWPA mutual

	OCSWCD 26.06	OCSWCD -1	OCSWCD mutual

**will be shown as a single headed arrow in figures because these organizations do not give anything to their interaction pair

Figures

Figure 1: Set of questions brought to each interview to guide the conversation with the subject

DISCERNING THE ISSUE AT HONEOYE LAKE

I. Explain to me what the issue with Honeoye is.
II. What has been accomplished?
III. What needs to be accomplished?
IV. What is feasible to be accomplished?
V. Who is the most important stakeholder in the harmful algal blooms problem in Honeoye?

QUESTIONS SPECIFICALLY ABOUT INDIVIDUAL CAPABILITIES AND STAKEHOLDER ORGANIZATIONS

I. What are you capable of doing to solve the HABs problem?
II. Who do you get permission, permits, et cetera from to make changes in the lake?
III. If you had permission, what would you ideally accomplish in the lake?
IV. Who do you answer to and/or who is above you?
V. Which federal, state, regional, county, local and/or non-governmental/foundation organizations are you in contact with?
VI. What has been your biggest obstacle in solving this problem?
VII. Have you had any major setbacks?

SUBJECT'S PERCEPTION OF THE ISSUE AND ITS RELATION TO CLIMATE CHANGE

I. Why do you think this is an important issue to tackle?
II. How does this issue affect the community?
III. Can you see the HABs problem in Honeoye affecting other lakes in the future?
IV. How do you think the HABs problem is related to climate change?

SUBJECT'S OPINION ABOUT FURTHER RESEARCH

I. Who should I talk to to better understand this issue?
II. Who do you think I should contact next?

DIFFERENTIATING THE ENVIRONMENTAL PROTECTION AGENCY FROM THE NEW YORK STATE DEPARTMENT OF CONSERVATION

I. Would you go to the New York State Department of Environmental Conservation or the Environmental Protection Agency first with an issue?
II. Who is more involved in the problems at Honeoye?

FINAL QUESTIONS

I. What have I left out?
II. What else do I need to know?

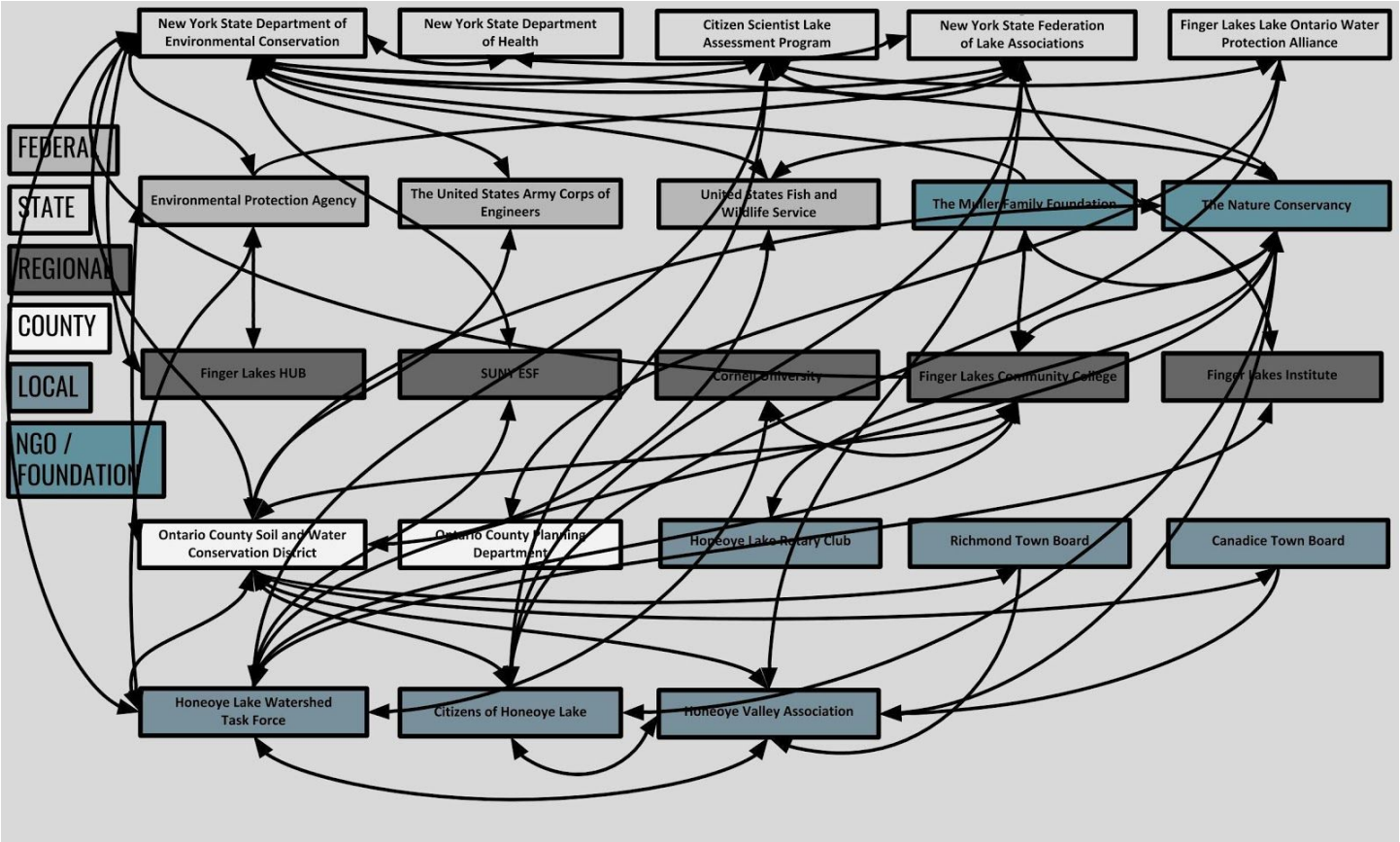


Figure 2: Web of interactions between organizations involved in studying or managing the HABs in Honeoye Lake

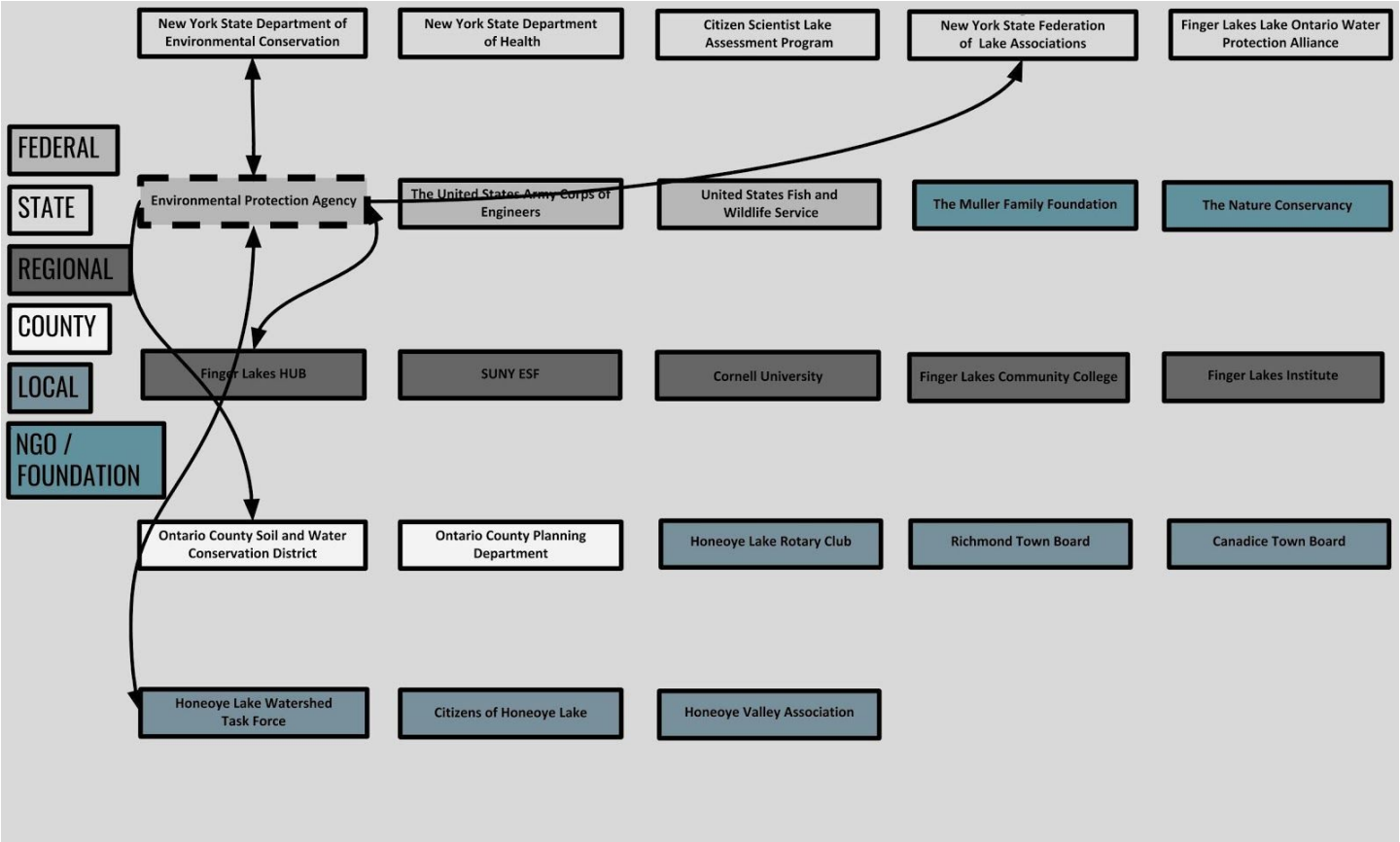


Figure 3: An example of one organization's interaction web. The United States Environmental Protection Agency interacts with:
NYSDEC: the EPA provides them with funding for lake projects and the NYSDEC runs the EPA mandated total maximum daily load studies (mutual relationship)
HLWTF: the EPA has consulted with HLWTF in the past when creating a watershed model for stakeholders to use (mutual relationship)
Finger Lakes HUB: the HUB works to establish an EPA mandated total maximum daily load plan for Honeoye Lake (mutual relationship)
NYSFOLA: the EPA provides funding for their state-wide projects like CSLAP, which analyzes harmful algal blooms (one-sided relationship)
OCSWCD: the EPA has provided them with funding for projects (one-sided relationship).

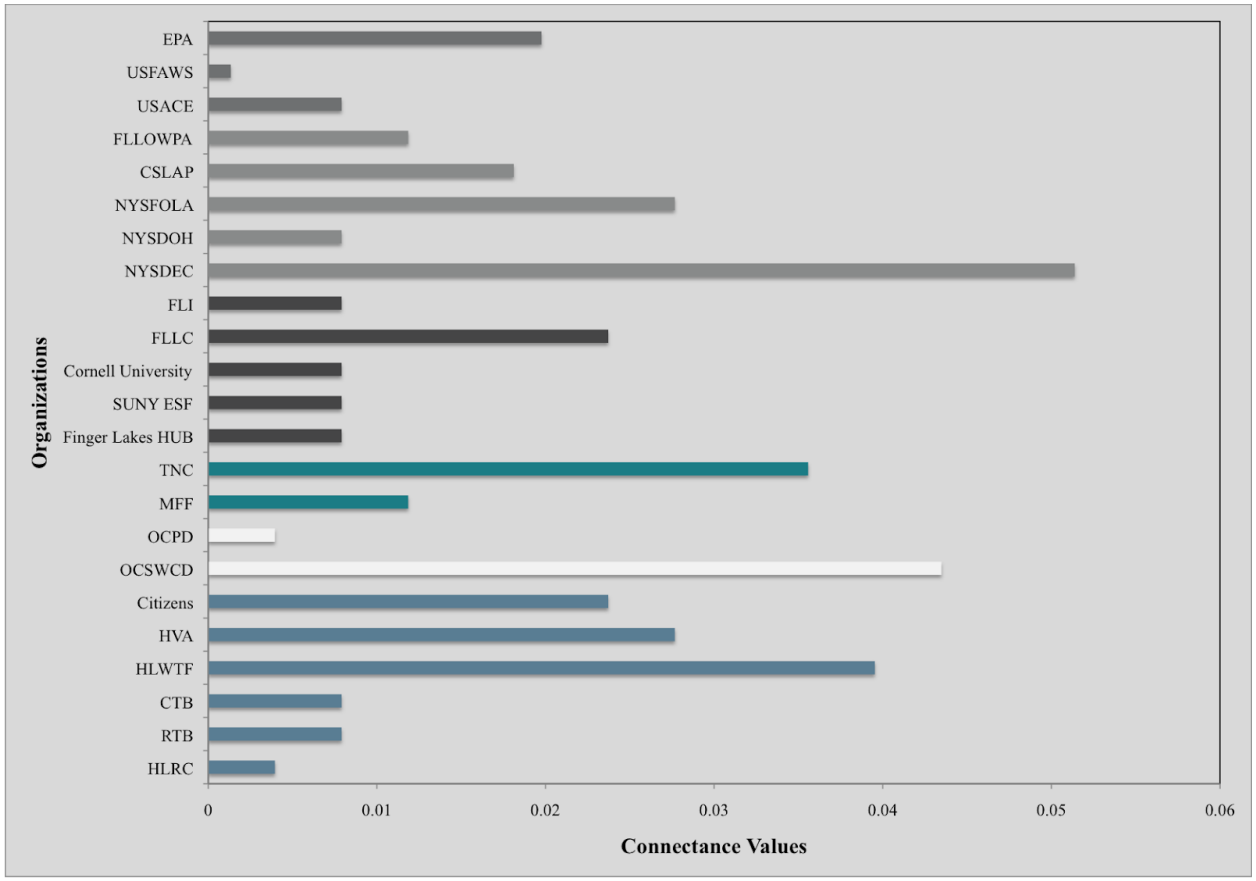


Figure 4: The network connectance value of organizations involved in studying or managing Honeoye Lake HABs. Abbreviations of organizations given in Table 3. The bar color represents the type of organization. Colors of organizations given in Figure 2 and Figure 3.

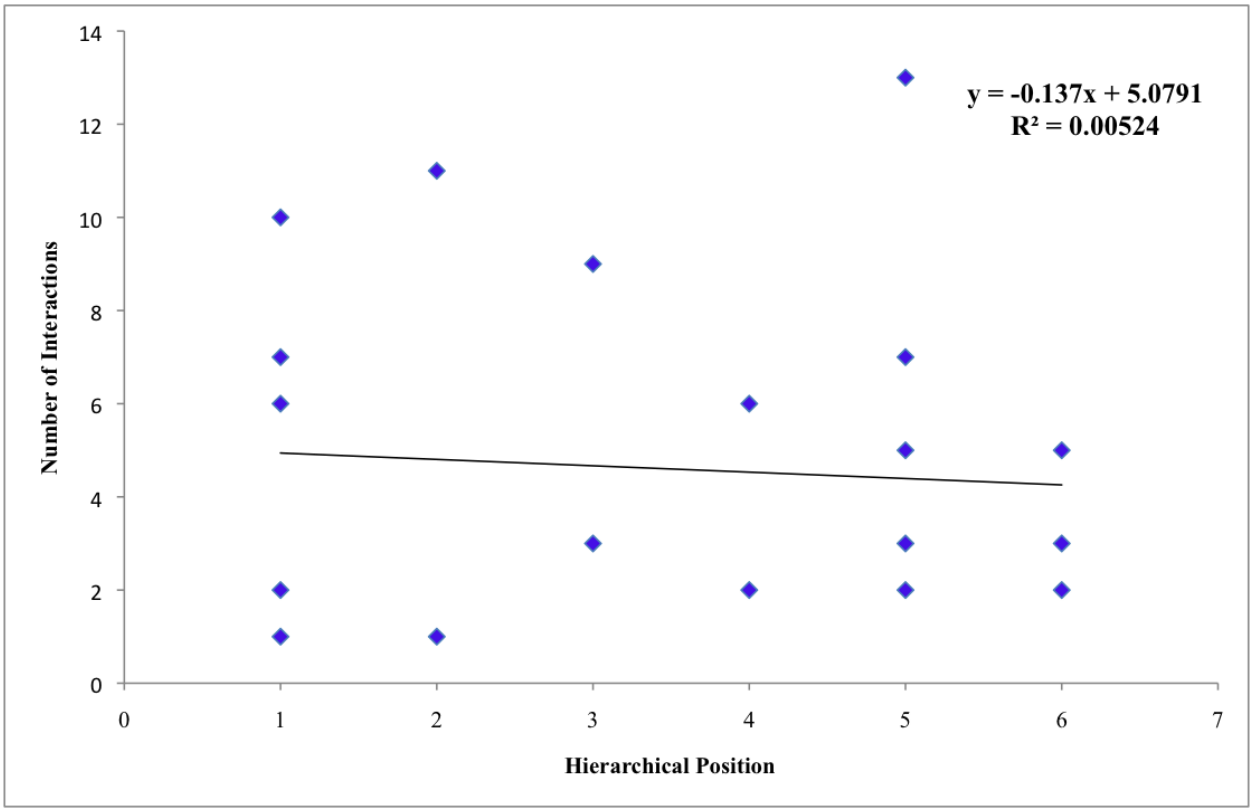


Figure 5: Number of interactions for each organization as a function of hierarchical position.

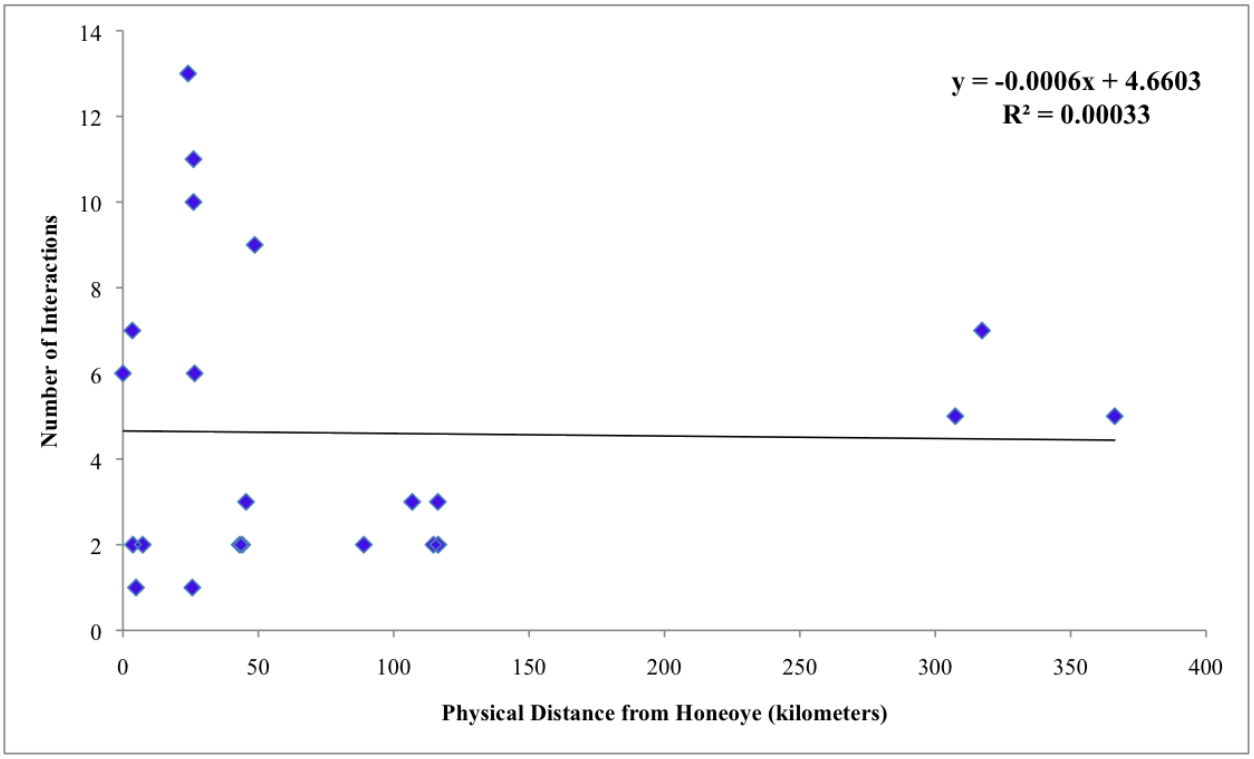


Figure 6: Number of interactions for each organization as a function of physical distance from Honeoye Lake.

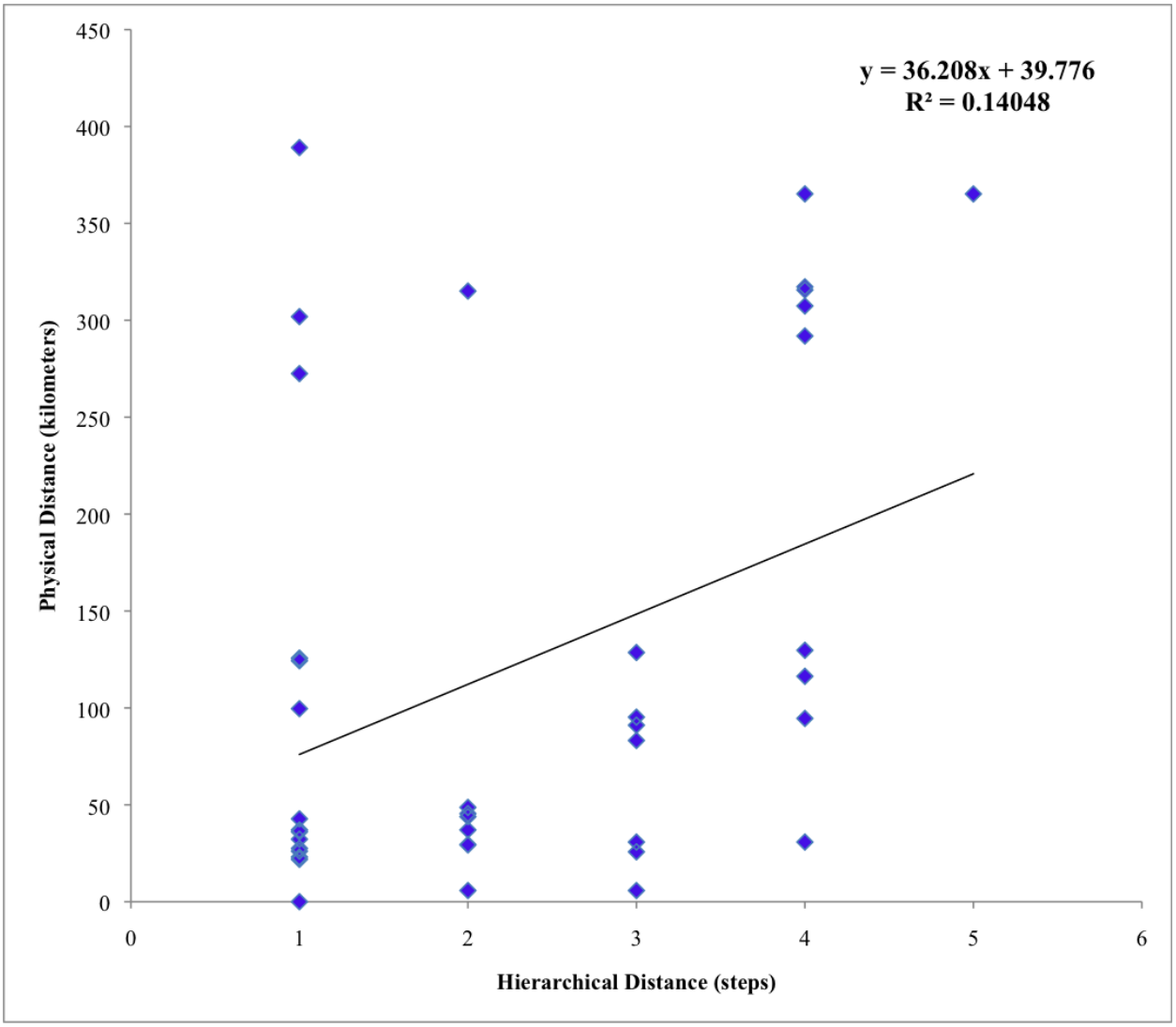
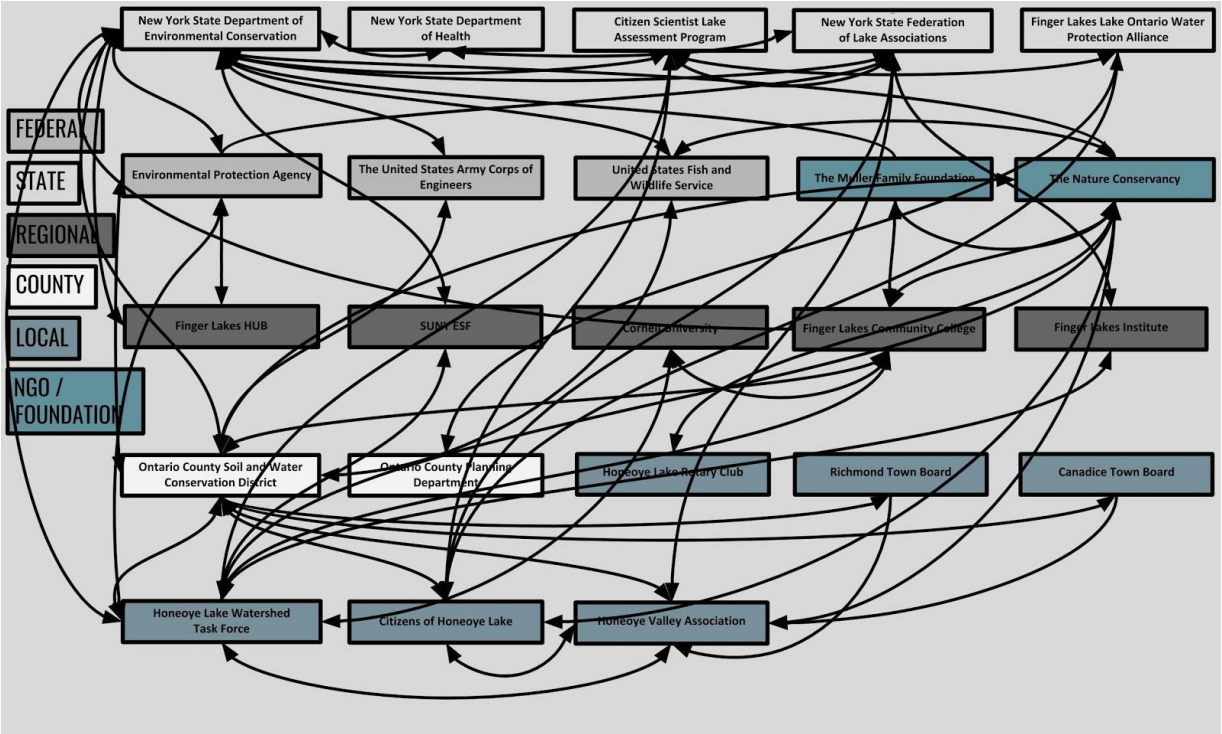


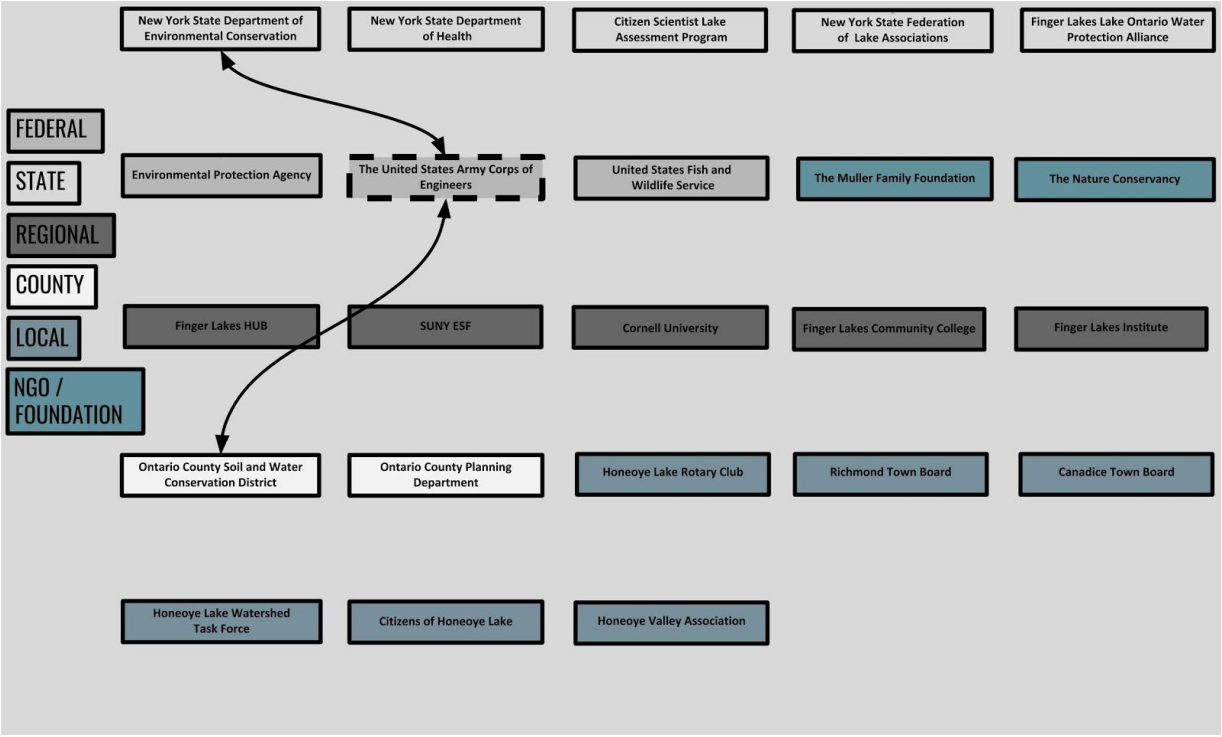
Figure 7: Physical distance between two collaborating organizations as a function of the hierarchical difference between two collaborating organizations (hierarchical distance).

Figure 8: Map of all of the organizations involved in the environmental management of Honeoye Lake (federal organizations in yellow, state organizations in blue, regional organizations in green, NGO/foundation organizations in red, county organizations in orange, and local organizations in purple).

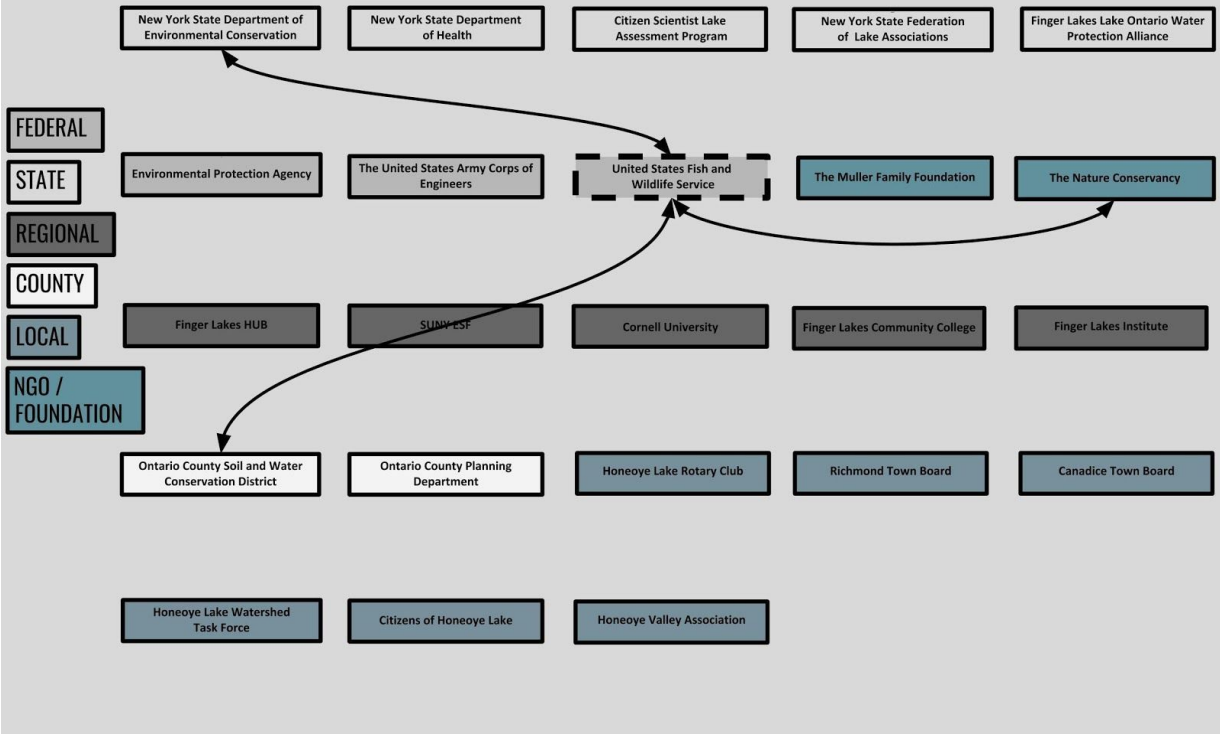
Appendix 1



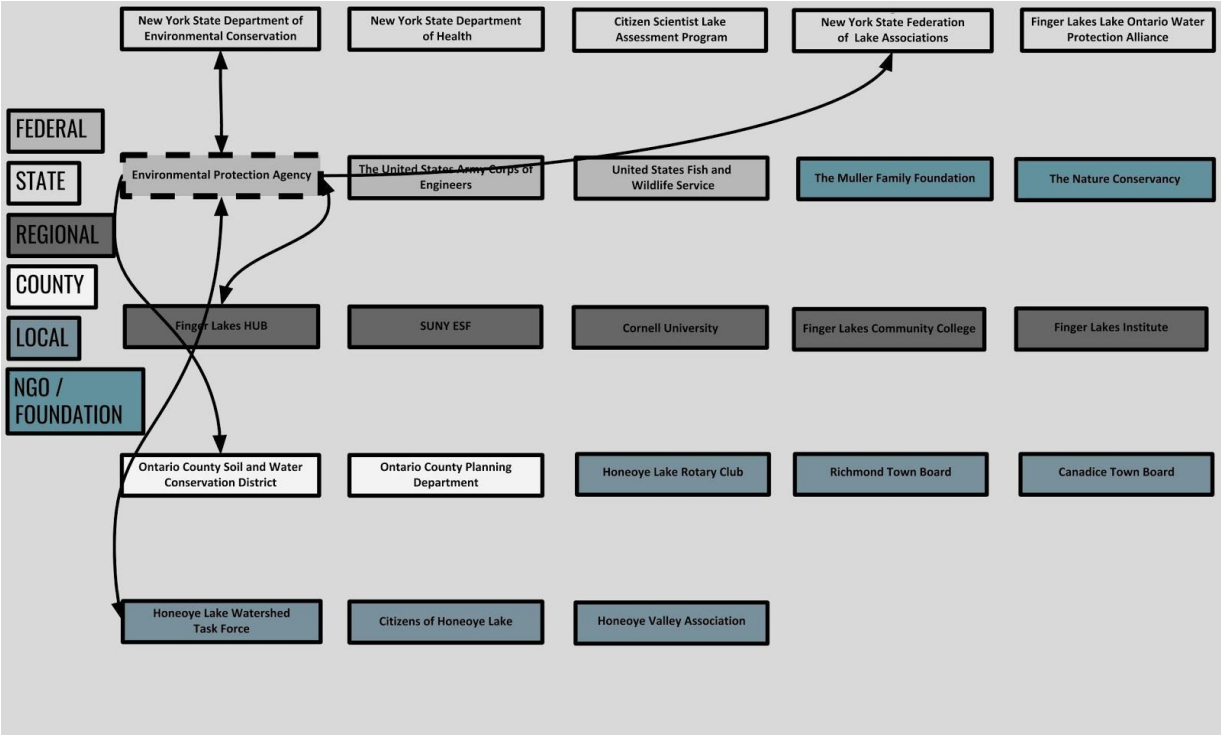
A map of the entire network's interactions, description of each organization's role in the environmental management of Honeoye Lake in Table 2



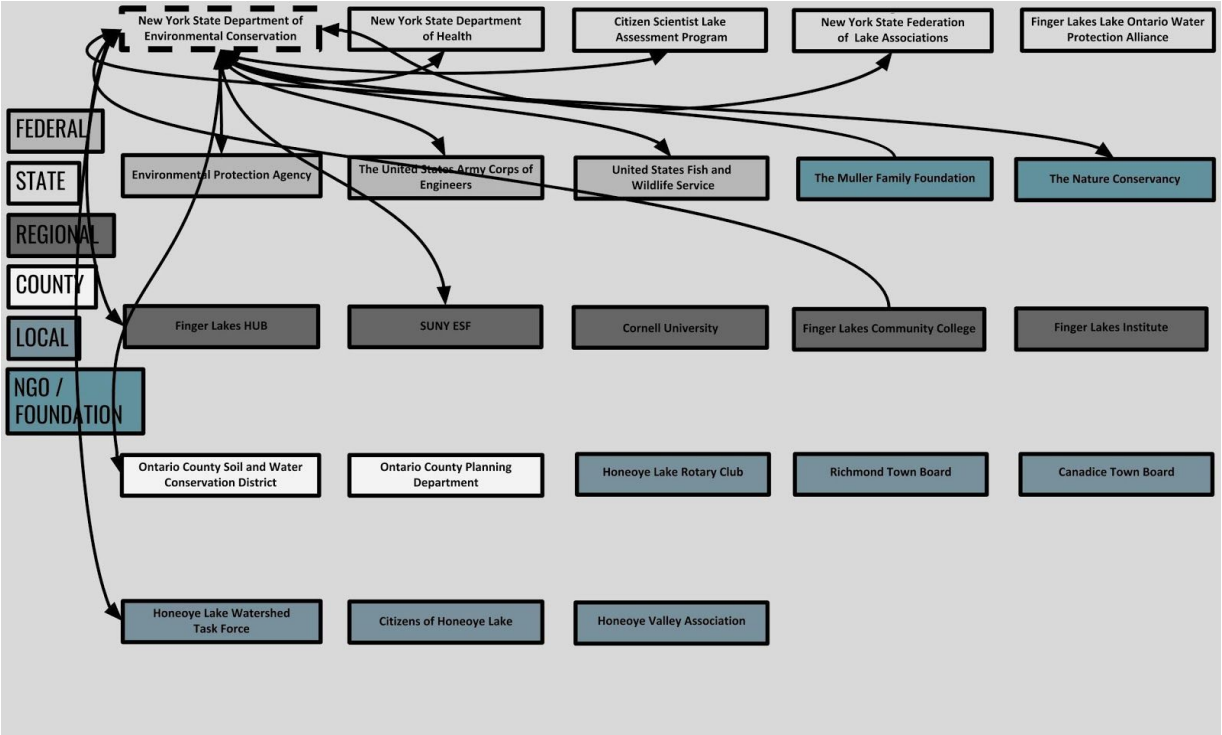
The United States Army Corps of Engineer's interactions. The USACE interacts with:
NYSDEC: USACE issues permits for work in and around the lake in conjunction with NYSDEC (mutual relationship)
OCSWCD: USACE visits potential project sites for approval before a project begins, reads permit requests submitted by OCSWCD (mutual relationship)



The United States Fish and Wildlife Service's interactions. The USFAWS interacts with:
TNC: USFAWS helped TNC get permits for inlet restoration project that was headed by OCSWCD (mutual relationship)
NYSDEC: USFAWS gets permits from NYSDEC after submitting proposals to them, specifically received permits from the NYSDEC for the inlet restoration project (mutual relationship)
OCSWCD: USFAWS designed the river's new path for OCSWCD's inlet restoration project (mutual relationship)

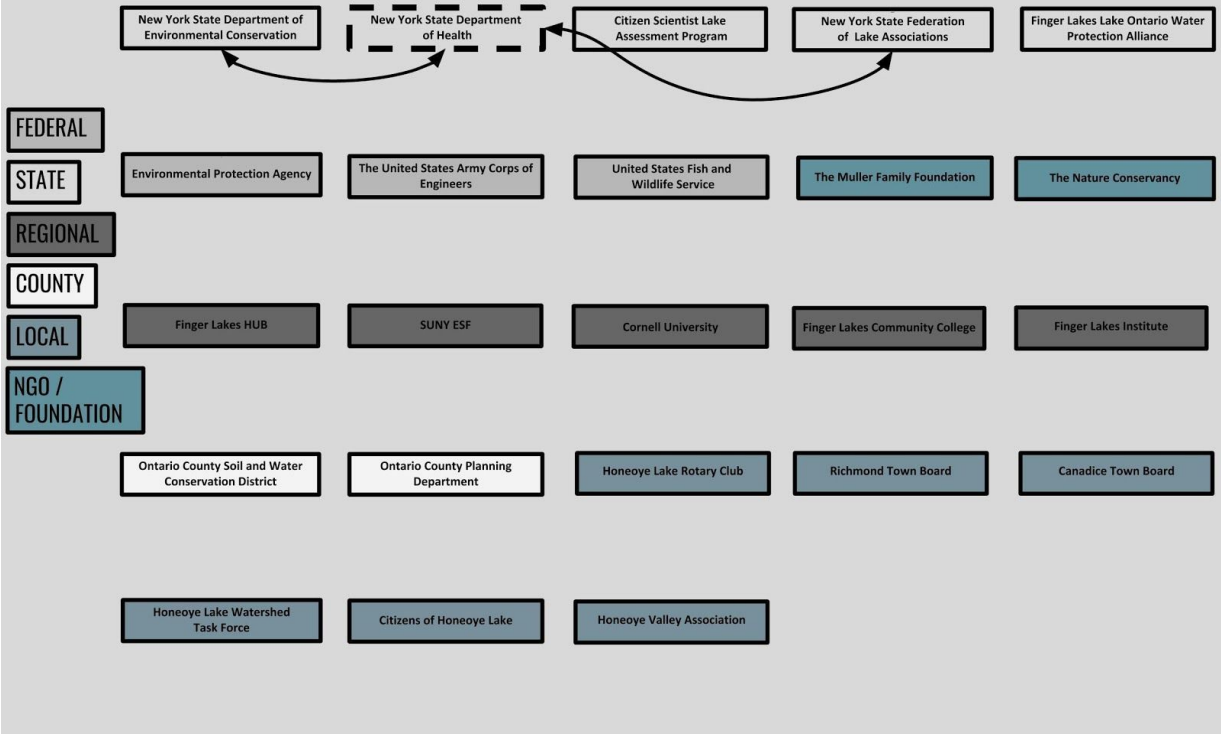


The Environmental Protection Agency's interactions. The EPA interacts with:
NYSDEC: the EPA provides them with funding for lake projects and the NYSDEC runs the EPA mandated total maximum daily load studies (mutual relationship)
HLWTF: the EPA has consulted with HLWTF in the past when creating a watershed model for stakeholders to use (mutual relationship)
Finger Lakes HUB: the HUB works to establish an EPA mandated total maximum daily load plan for Honeoye Lake (mutual relationship)
NYSFOLA: the EPA provides funding for their state-wide projects like CSLAP, which analyzes harmful algal blooms (one-sided relationship)
OCSWCD: the EPA has provided them with funding for projects (one-sided relationship).

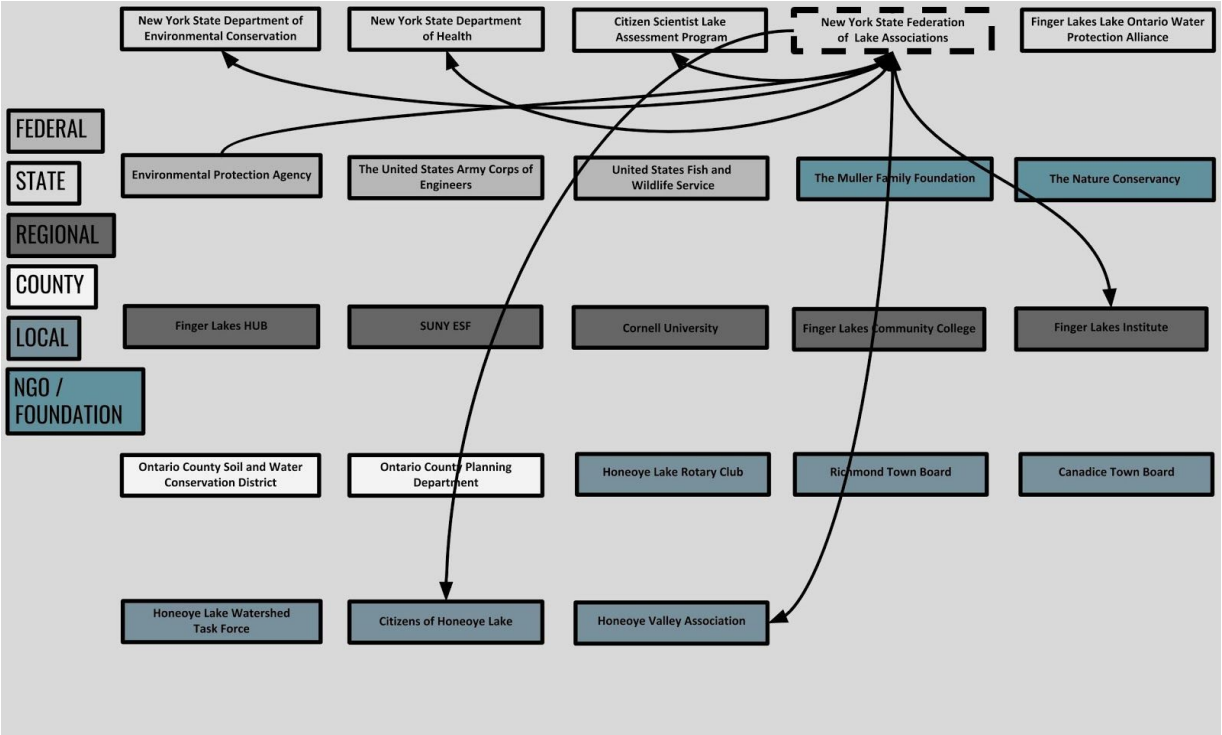


The New York State Department of Environmental Conservation's interactions. The NYSDEC interacts with:
USFAWS: USFAWS gets permits from the NYSDEC, specifically received permits from the NYSDEC for OCSWCD's inlet restoration project (mutual relationship)
USACE: NYSDEC issues permits in conjunction with USACE (mutual relationship)
EPA: EPA gives NYSDEC funding, EPA mandates the total maximum daily load studies that the NYSDEC oversees and the watershed plan NYSDEC creates to get phosphorus levels in the lake within water quality standards (mutual relationship)
OCSWCD: NYSDEC gives OCSWCD permits and funding for projects, does site visits for potential project locations, partners with OCSWCD for agricultural best management practices projects (mutual relationship)
SUNY ESF: NYSDEC gives Dr. Greg Boyer of SUNY ESF funding to look for blue green algae and blue green algae toxins in Honeoye, collects SUNY ESF's analysis of algae samples and archives it, reports the results of SUNY ESF's analysis to the public every Friday (mutual relationship)
NYSFOLA: CSLAP is run as a cooperative between NYSDEC and NYSFOLA, NYSFOLA has a lobbying interest at the state level to push for funding (mutual relationship)
CSLAP: CSLAP is run as a cooperative between NYSDEC and NYSFOLA, NYSDEC gets lake data from CSLAP (mutual relationship)
Finger Lakes HUB: NYSDEC created Finger Lakes HUB (mutual relationship)
FLCC: FLCC does outreach and design for NYSDEC funded/permitted projects (one-sided relationship)
HLWTF: sends NYSDEC basic limnology information after their sampling every Monday (digital pictures, surface water temperatures, opinion on whether an algal bloom will be harmful or not), HLWTF has a contact at NYSDEC with whom they communicate about

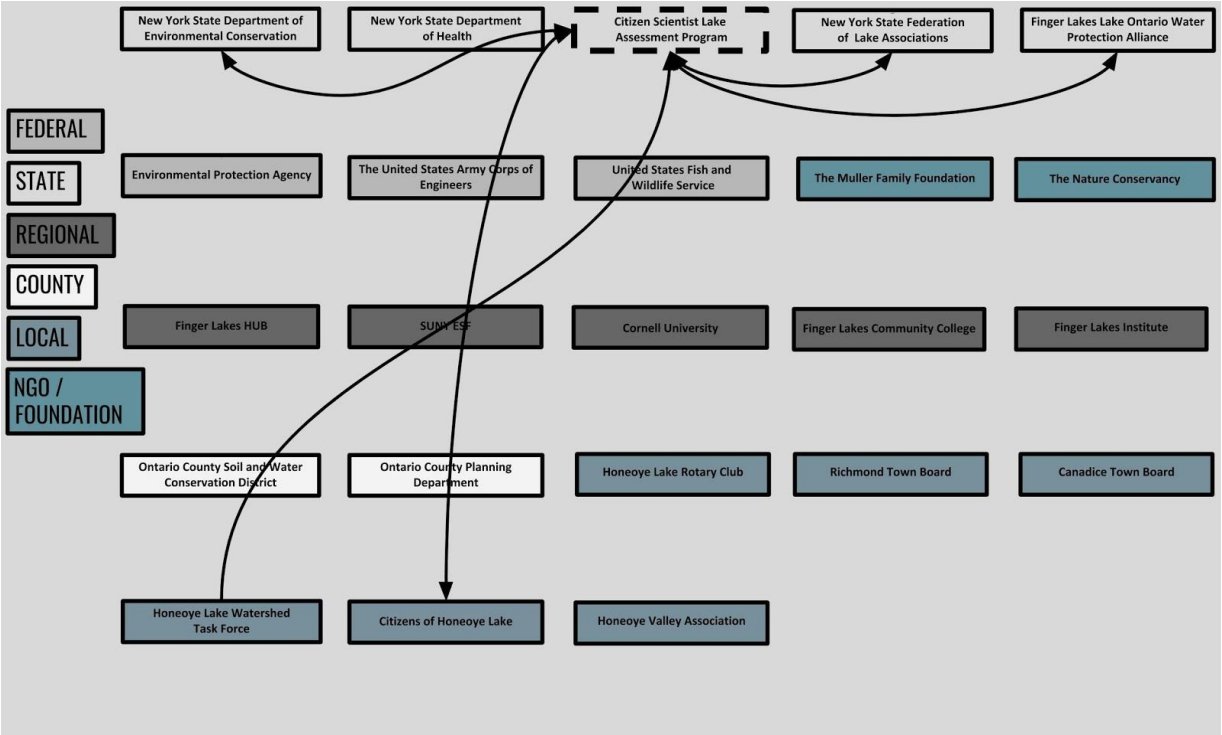
issues in the lake (mutual relationship)
MFF: MFF held 3,500 acres of land that was subsequently donated to the NYSDEC (one-sided relationship)
TNC: NYSDEC receives land donations from TNC, gives them permits for projects in and around the lake (mutual relationship)
NYSDOH: NYSDEC coordinates with NYSDOH to keep Honeoye residents safe from HABs, if there is an algal bloom these two entities communicate and decide what should be done (mutual relationship)



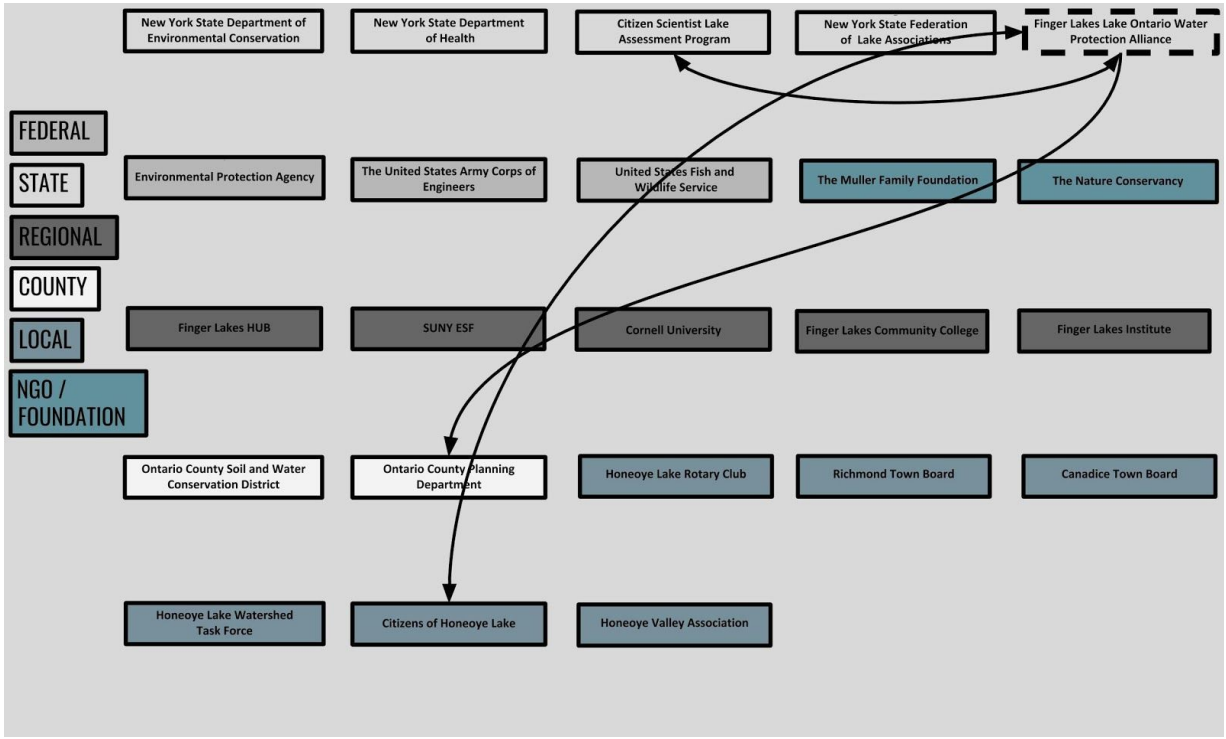
The New York State Department of Health's interactions. The NYSDOH interacts with:
NYSDEC: NYSDOH coordinates with NYSDEC to keep Honeoye residents safe from HABs, if there is an algal bloom these two entities communicate and decide what should be done, NYSDOH is specifically in charge of closing public access points, like the beach (mutual relationship)
NYSFOLA: NYSDOH has a working relationship with NYSFOLA (mutual relationship)



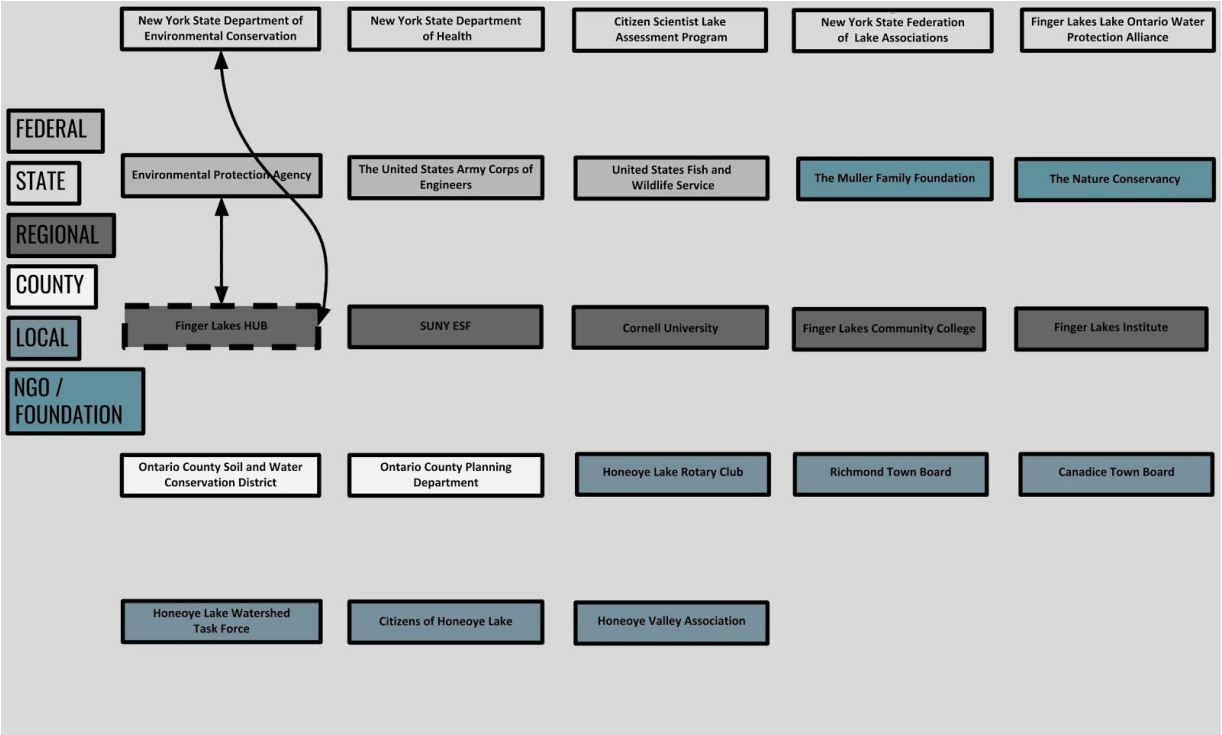
The New York State Federation of Lake Associations' interactions. NYSFOLA interacts with:
NYSDEC: CSLAP is run as a cooperative between NYSDEC and NYSFOLA, NYSFOLA has a lobbying interest at the state level to push for funding (mutual relationship)
CSLAP: NYSFOLA provides program support via CSLAP, NYSFOLA does all the administrative work of getting the models to the public and all of the paperwork for CSLAP (mutual relationship)
NYSDOH: NYSFOLA has a working relationship with NYSDOH (mutual relationship)
FLI: NYSFOLA has a working relationship with FLI (mutual relationship)
EPA: NYSFOLA receives funding for state programs from the EPA (mutual relationship)
HVA: NYSFOLA works with HVA, HVA is a member of NYSFOLA (mutual relationship)
Citizens: NYSFOLA does public education on lake and watershed management (one-sided relationship)



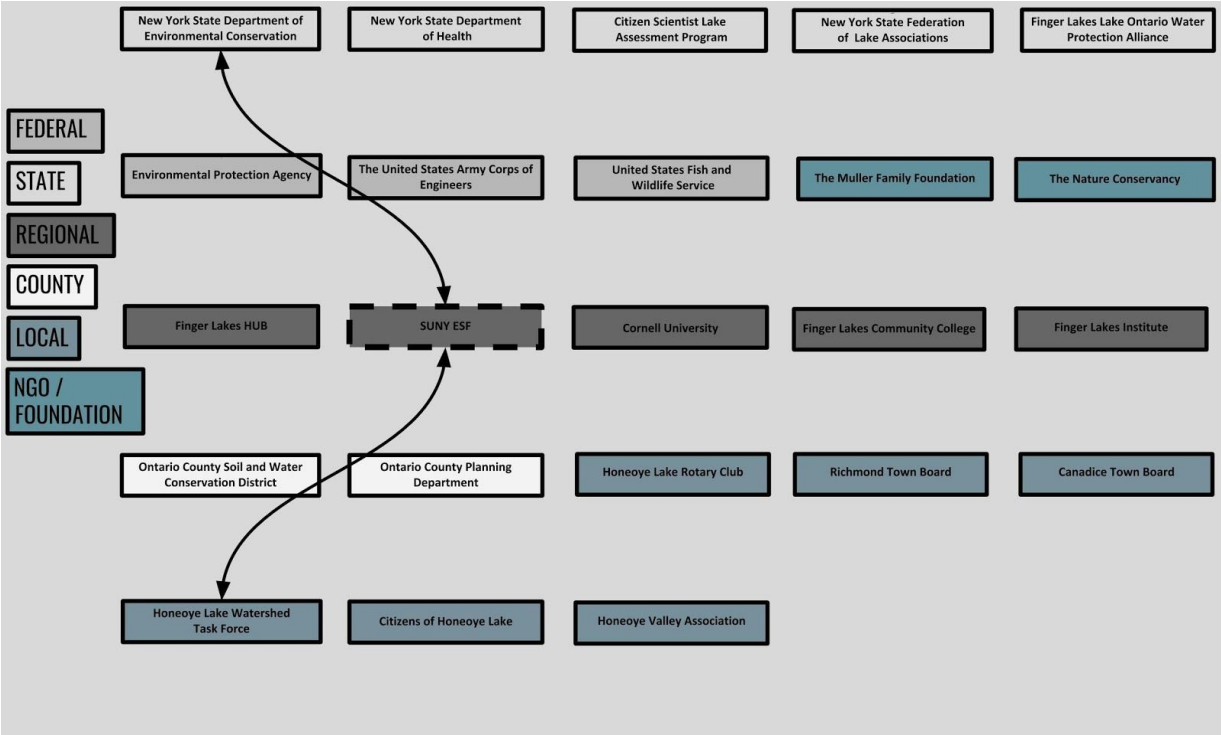
The Citizen Scientist Lake Assessment Program's interactions. CSLAP interacts with:
HLWTF: HLWTF collects data for CSLAP (one-sided relationship)
NYSDEC: NYSDEC uses information and data collected by CSLAP to make management decisions (mutual relationship)
FLLOWPA: used to run CSLAP (mutual relationship)
NYSFOLA: CSLAP provides NYSFOLA with data and information used to make management decisions (mutual relationship)
Citizens: CSLAP trains citizens to collect samples and data from the lake (mutual relationship)



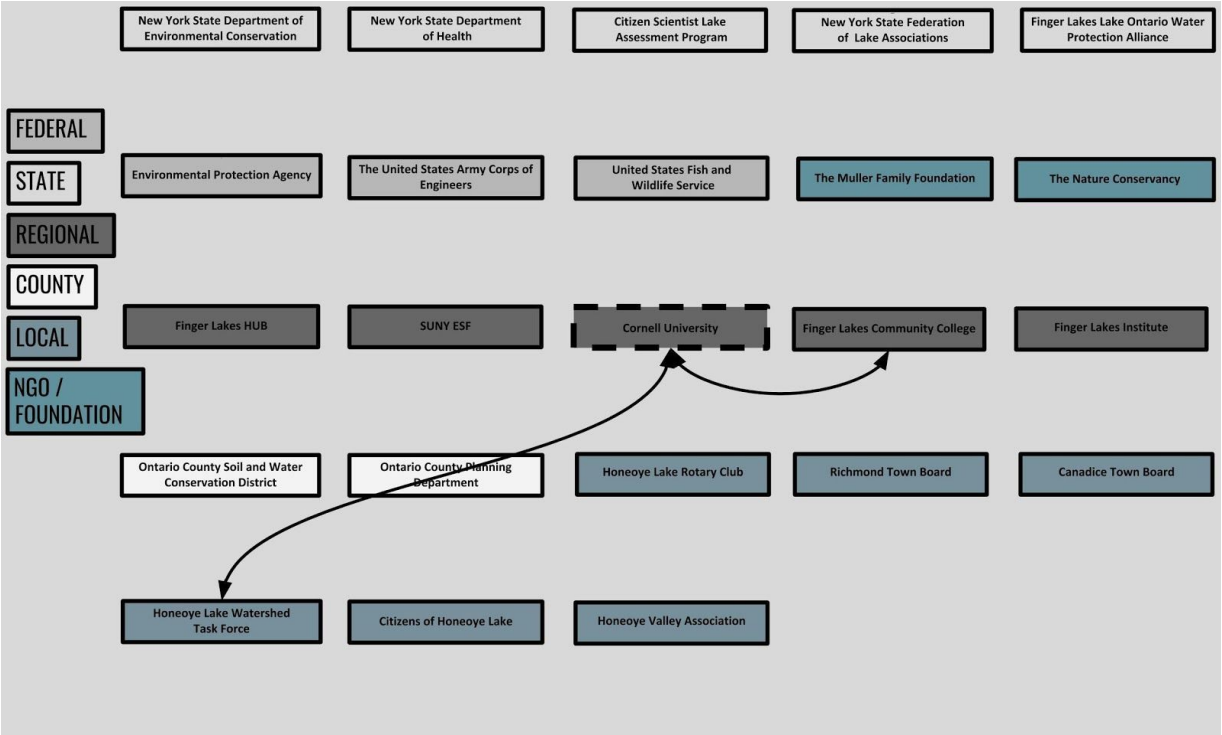
The Finger Lakes Lake Ontario Water Protection Alliance's interactions. FLLOWPA interacts with:
CSLAP: FLLOWPA used to run CSLAP (mutual relationship)
OCPD: FLLOWPA provides funding to OCPD for the vegetation harvesting program that occurs on Honeoye (one-sided relationship)
Citizens: FLLOWPA funds public education workshops that citizens attend (mutual relationship)



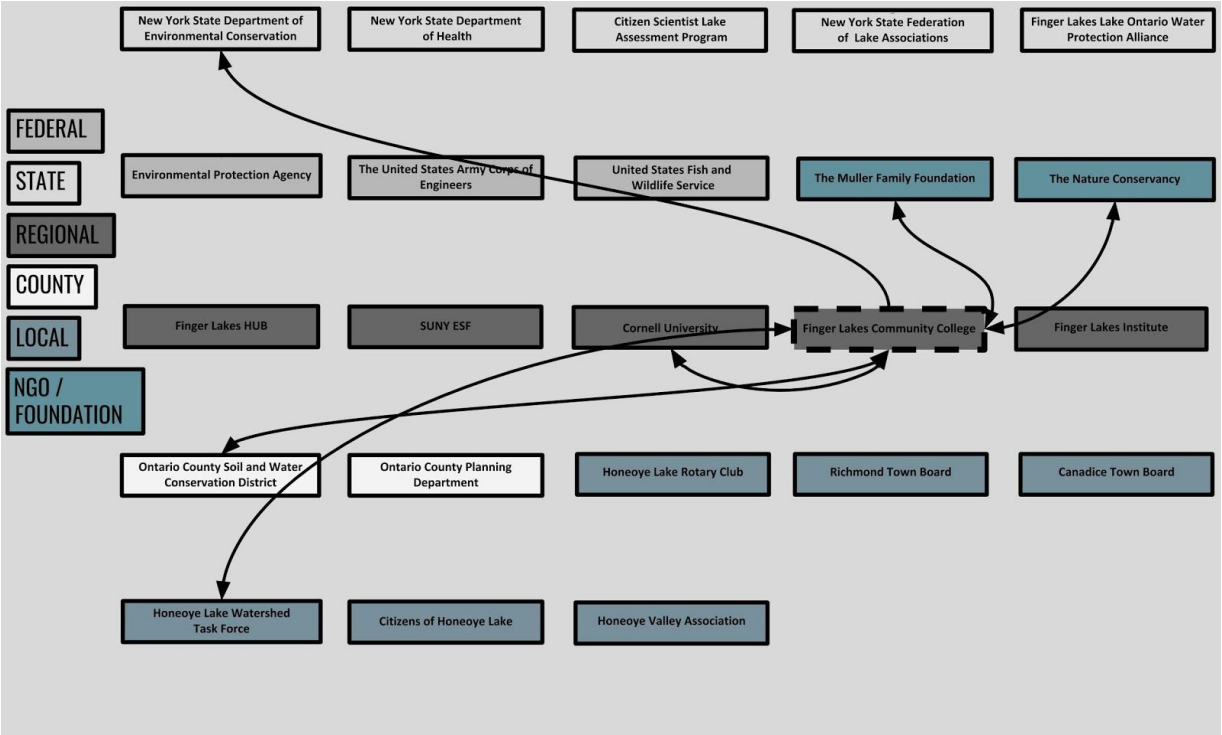
The Finger Lakes HUB's interactions. Finger Lakes HUB interacts with:
EPA: the HUB works to establish a total maximum daily load (TMDL) plan for Honeoye, which is an EPA mandated plan (mutual relationship)
NYSDEC: NYSDEC created the HUB, the HUB has a voice at the state level for lobbying (mutual relationship)



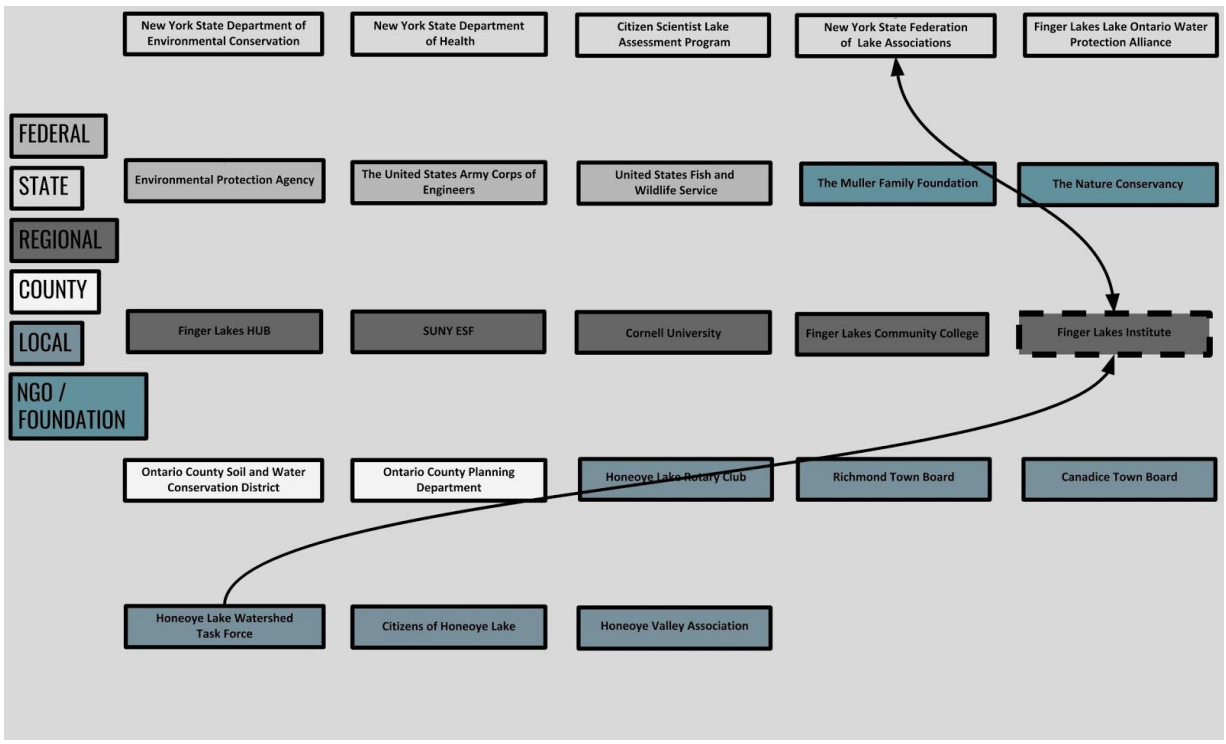
SUNY ESF's interactions. SUNY ESF interacts with:
HLWTF: HLWTF sends SUNY ESF lake samples from Honeoye for analysis at the SUNY esf laboratory (mutual relationship)
NYSDEC: Dr. Greg Boyer of SUNY ESF sends NYSDEC analysis of Honeoye Lake samples every week so NYSDEC can update the public what is going on in the lake (mutual relationship)



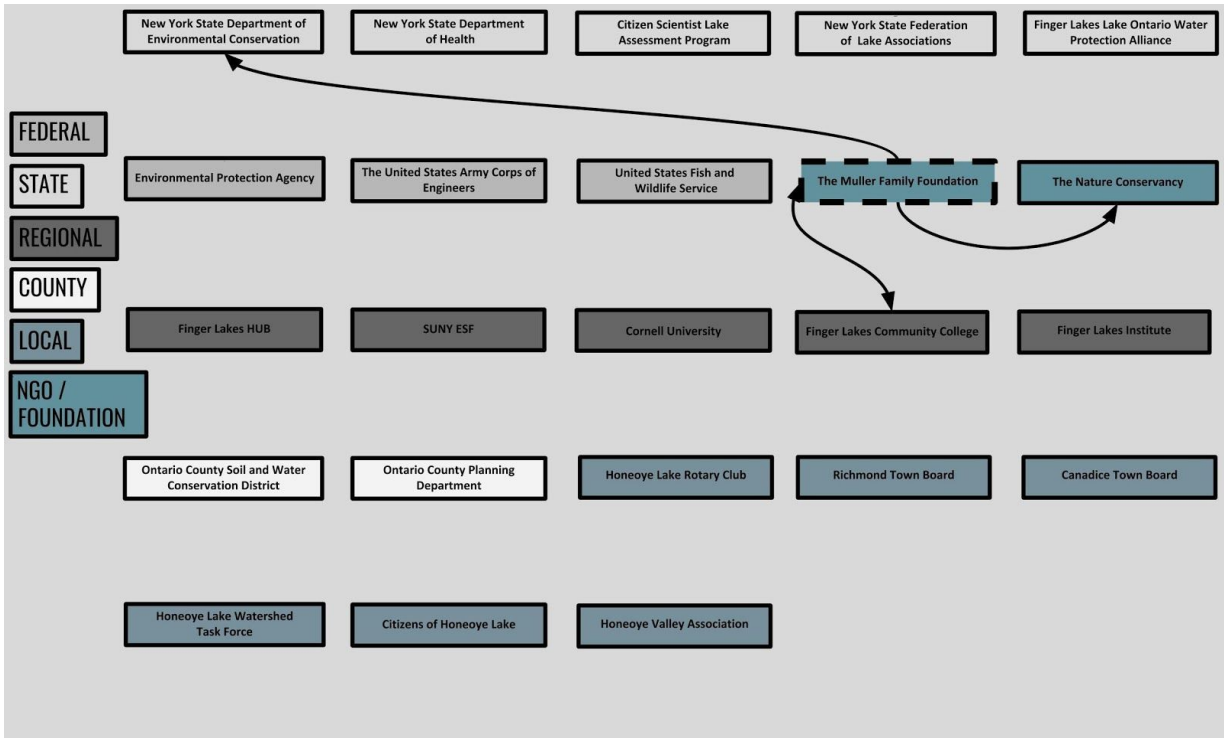
Cornell University's interactions. Cornell University interacts with:
HLWTF: Cornell University collects data from Honeoye Lake with the chairman of HLWTF, for analysis of harmful algal blooms (mutual relationship)
FLCC: Cornell University does research with FLCC to figure out where and when HABs occur and why they occur (mutual relationship)



Finger Lakes Community College's interactions. FLCC interacts with:
Cornell University: FLCC does research with Cornell University to figure out where and when HABs occur in Honeoye and why they continue to occur (mutual relationship)
MFF: MFF odnated the Muller field station to FLCC for research, MFF supports FLCC's research effrots in water quality and education programming for students (mutual relationship)
HLWTF: FLCC advises HLWTF on how to work towards solutions in the lake (mutual relationship)
NYSDEC: FLCC does design and outreach for NYSDEC funded/permitted projects (one-sided relationship)
TNC: FLCC provided labor and seed collection for TNC's tree planting program (mutual relationship)
OCSWCD: FLCC collaborated with OCSWCD on agricultural best management practices project (mutual relationship)

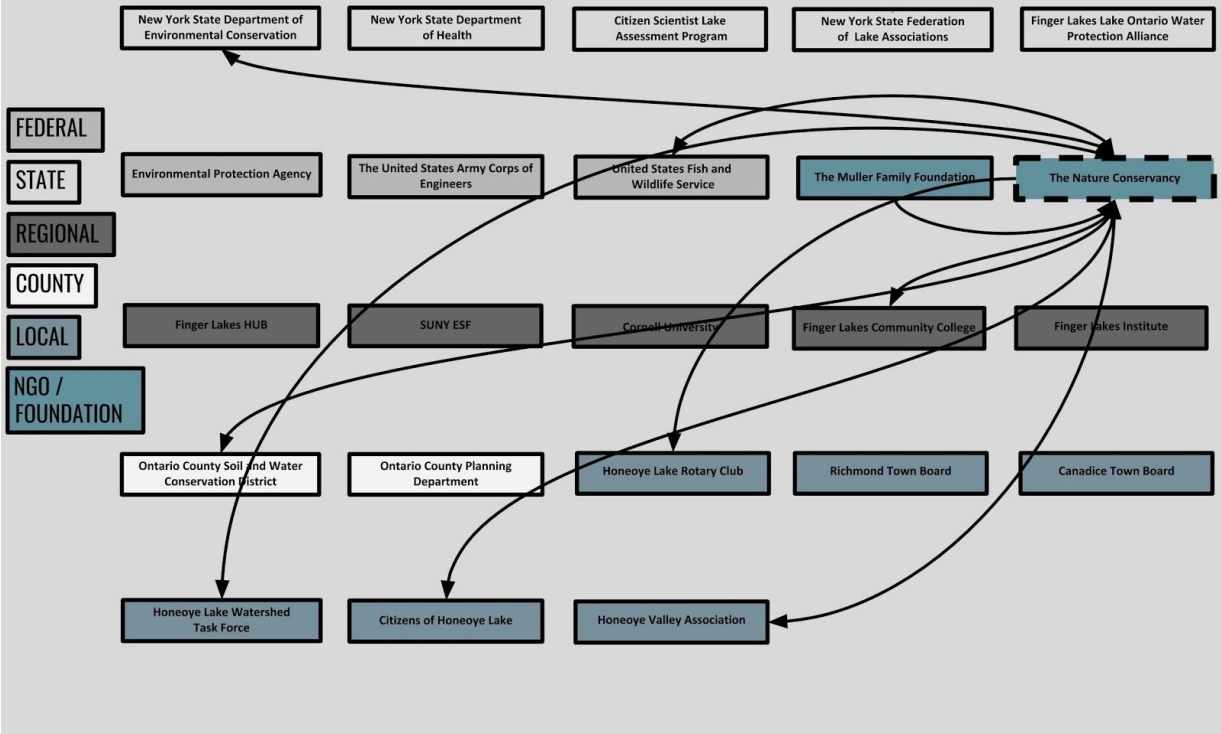


Finger Lake Institute's interactions. FLI interacts with:
NYSFOLA: FLI has a working relationship with NYSFOLA (mutual relationship)
HLWTF: HLWTF collects nitrogen data for FLI to analyze (mutual relationship)

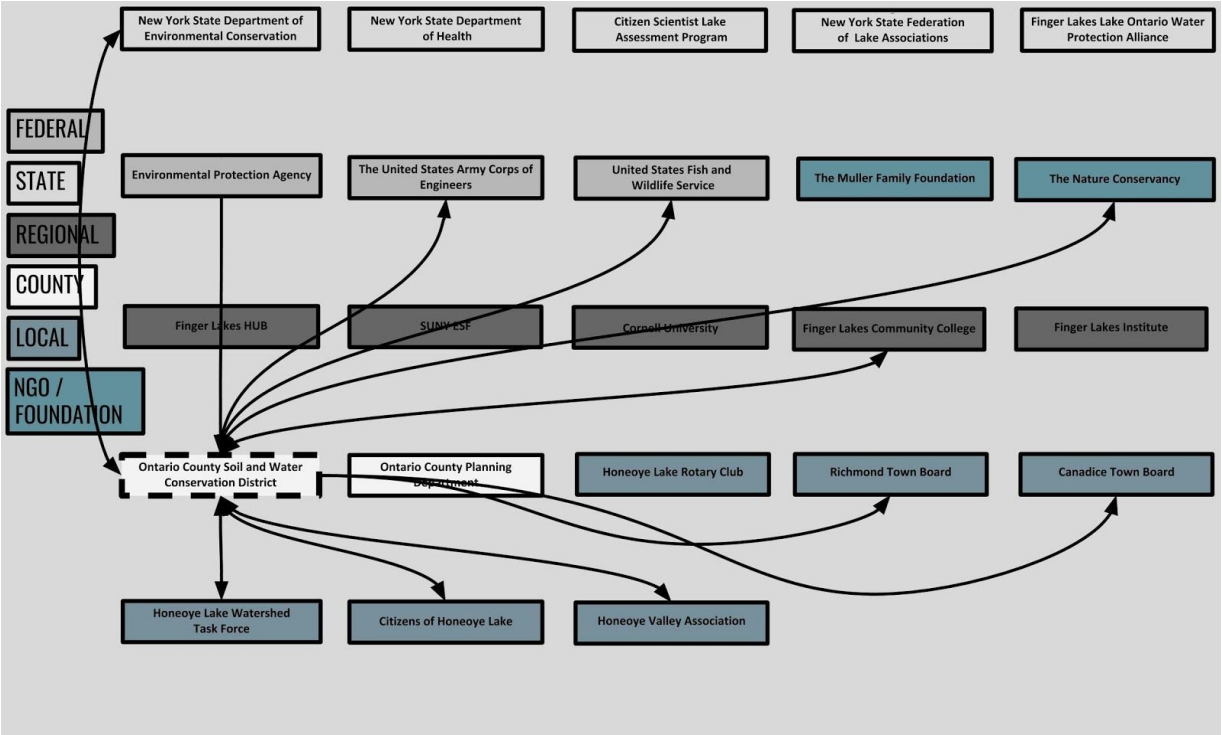


The Muller Family Foundation's interactions. MFF itneracts with:

NYSDEC: MFF held 3,500 acres of land that was subsequently donated to the NYSDEC (one-sided relationship)
TNC: MFF donates land to TNC to be used in conservation efforts (one-sided relationship)
FLCC: donated Muller field station to FLCC, reviews the data that FLCC collects on Honeoye Lake (mutual relationship)

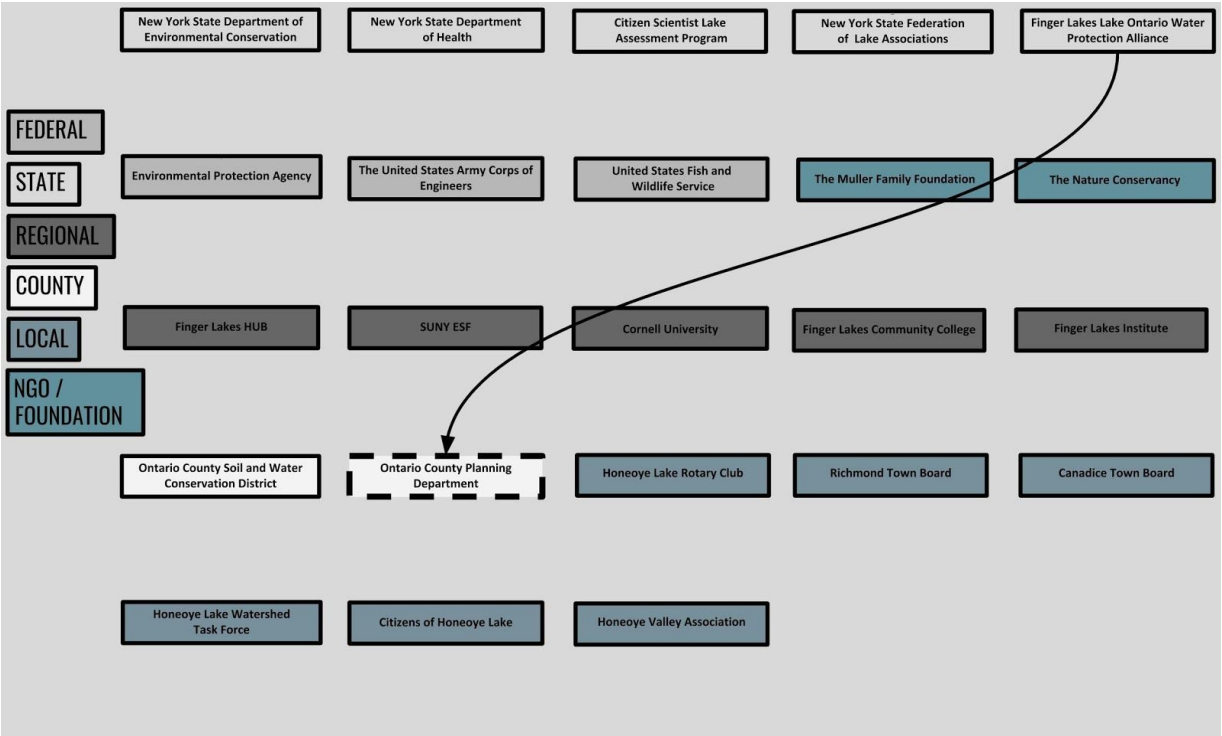


The Nature Conservancy's interactions. TNC interacts with:
Citizens: TNC does monitoring on avian and amphibian research and communicates these findings to the public (mutual relationship)
NYSDEC: TNC has donated thousands of acres of land to NYSDEC (mutual relationship)
FLCC: TNC communicates Honeoye research to FLCC and receives input from FLCC for HABs monitoring projects (mutual relationship)
OCSWCD: TNC purchased the property that OCSWCD's inlet restoration project was sitting on, helped OCSWCD get permits for that same project (mutual relationship)
HVA: works with HVA on projects in and around the lake (mutual relationship)
HLRC: TNC communicates with HLRC because HLRC members own a significant amount of land in the watershed (one-sided)
USFAWS: TNC worked with USFAWS to get permits for OCSWCD's inlet restoration project (mutual relationship)
HLWTF: TNC works with HLWTF on project management (mutual relationship)
MFF: TNC receives land donations from MFF for TNC's conservation efforts (one-sided relationship)

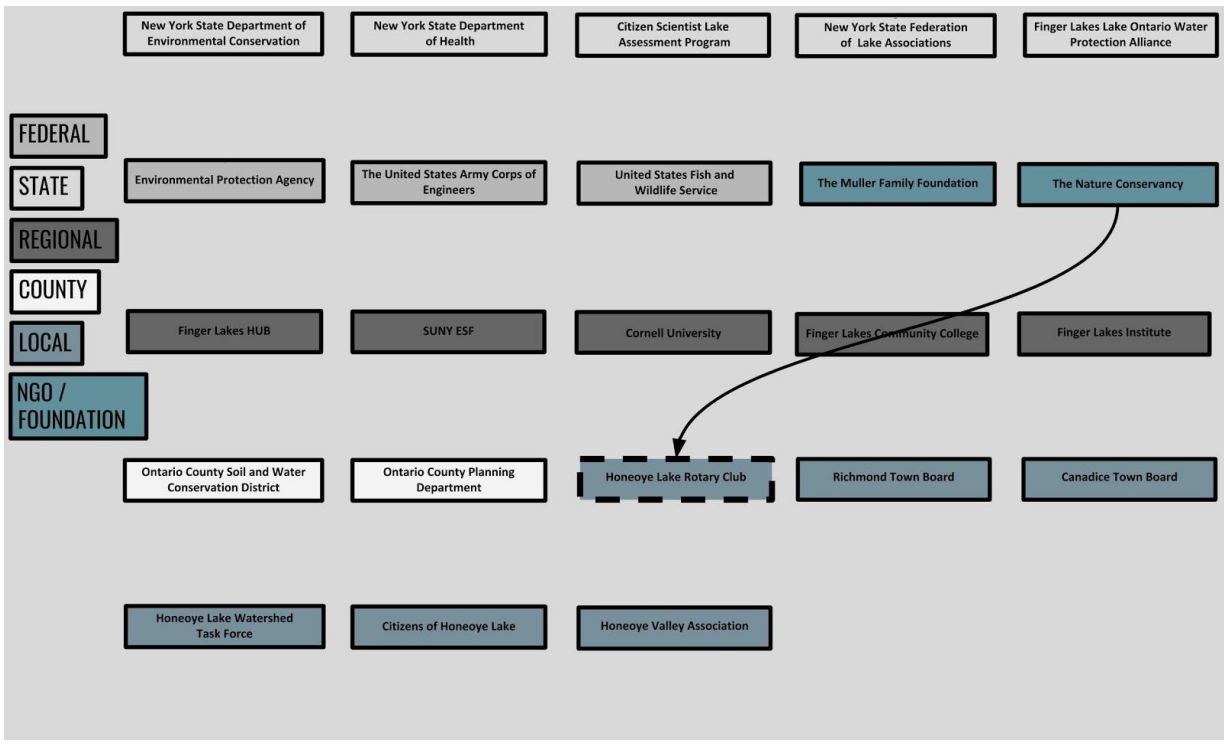


Ontario County Soil and Water Conservation District's interactions. OCSWCD interacts with:
FLCC: collaborated with FLCC on agricultural best management practices project (mutual relationship)
NYSDEC: collaborated with NYSDEC on agricultural best management practices project (mutual relationship)
HLWTF: OCSWCD sits on HLWTF's board, votes on HLWTF's board
HVA: presents to HVA, worked with HVA creating grass waterways and water storage sediment control basins to control farm runoff and keep soil where it should be (mutual relationship)
USACE: OCSWCD works with USACE on projects in and around the lake (mutual relationship)
TNC: OCWSCD provides technical support and labor supply for TNC's projects (mutual relationship)
USFAWS: OCSWCD collaborated with USFAWS on inlet restoration project (mutual relationship)
RTB: assists RTB with permitting process and search for funding for town projects, worked with RTB on water control structures to be implemented in the towns (stream bank stabilization on major gullies, vernal pools, basins and inlet control, stormwater retention ponds, stream bank protections, and road culverts) (one-sided relationship)
CTB: assists CTB with permitting process and search for funding for town projects, worked with CTB on water control structures to be implemented in the towns (stream bank stabilization on major gullies, vernal pools, basins and inlet control, stormwater retention ponds, stream bank protections, and road culverts) (one-sided relationship)
EPA: OCSWCD receives funding for their projects from EPA grants (one-sided relationship)
Citizens: OCSWCD holds community workshops for citizens to teach people how to build

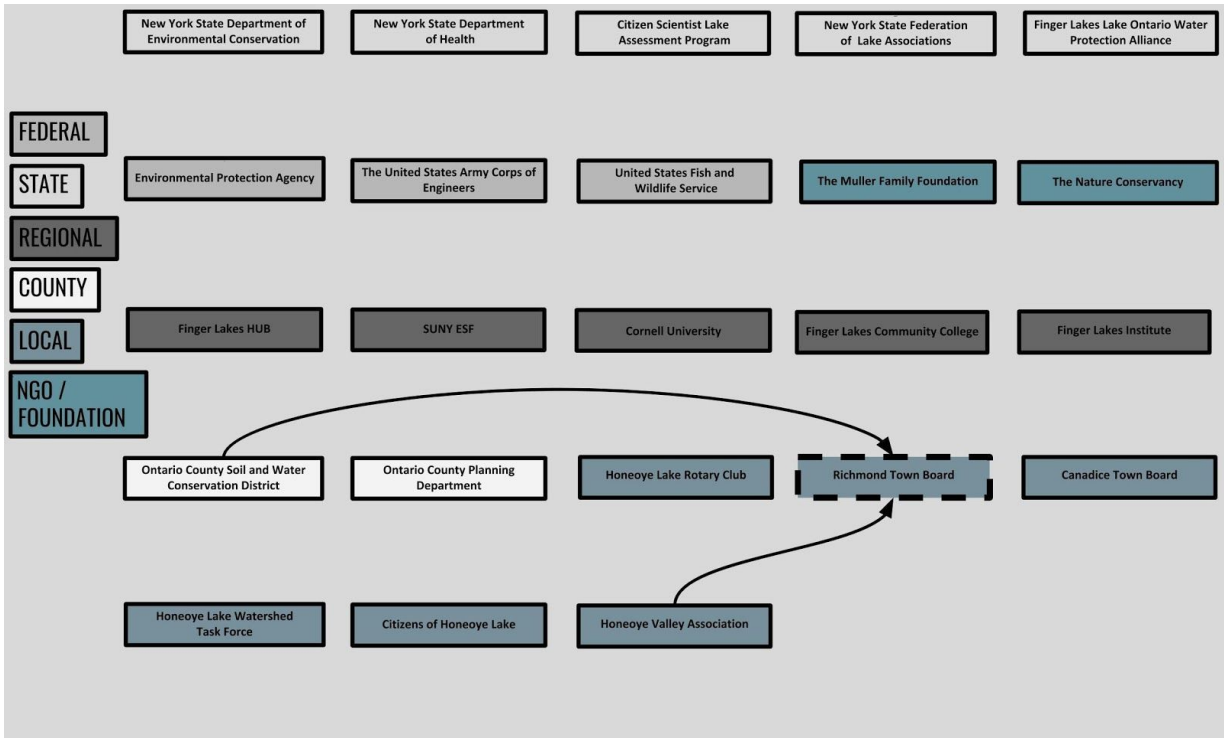
vernal ponds so citizens could make them in their own backyard (mutual relationship)



Ontario County Planning Department's interaction. OCPD interacts with:
FLLOWPA: OCPD receives funding from FLLOWPA for the weed harvesting program they run (one-sided)

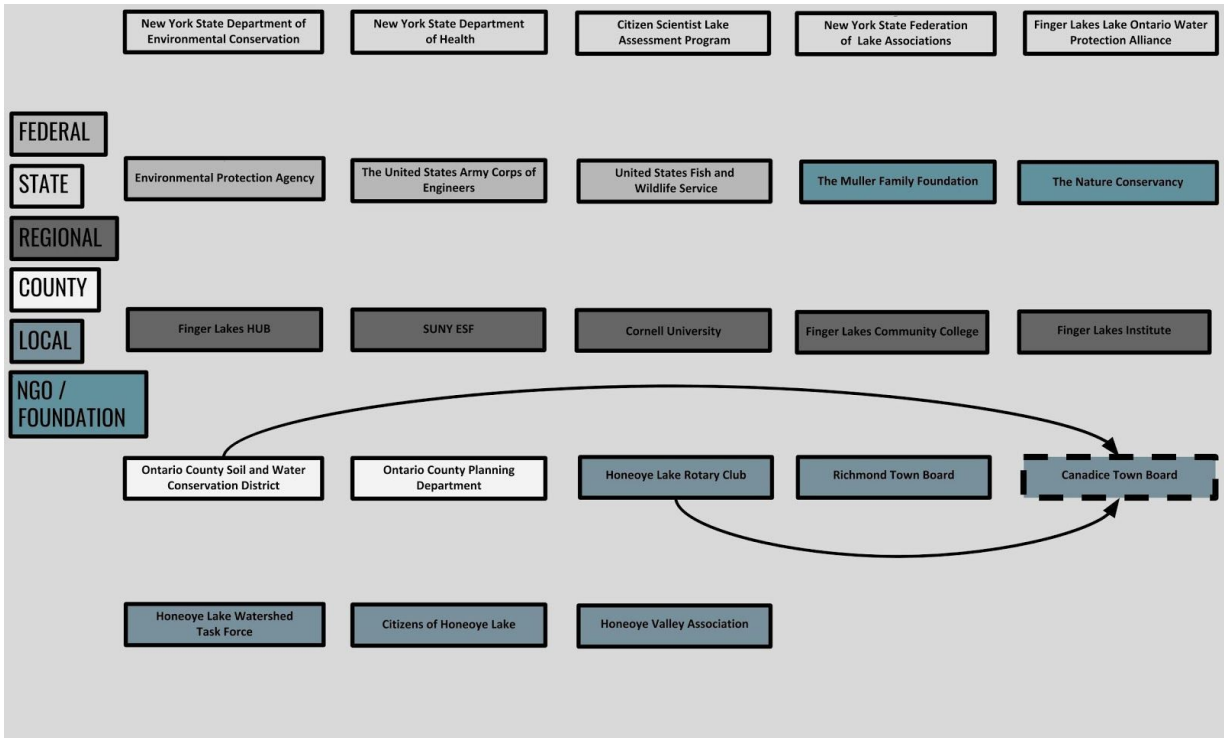


Honeoye Lake Rotary Club's interaction. HLRC interacts with:
TNC: TNC communicates with HLRC because HLRC members own a significant amount of land in the watershed (one-sided)

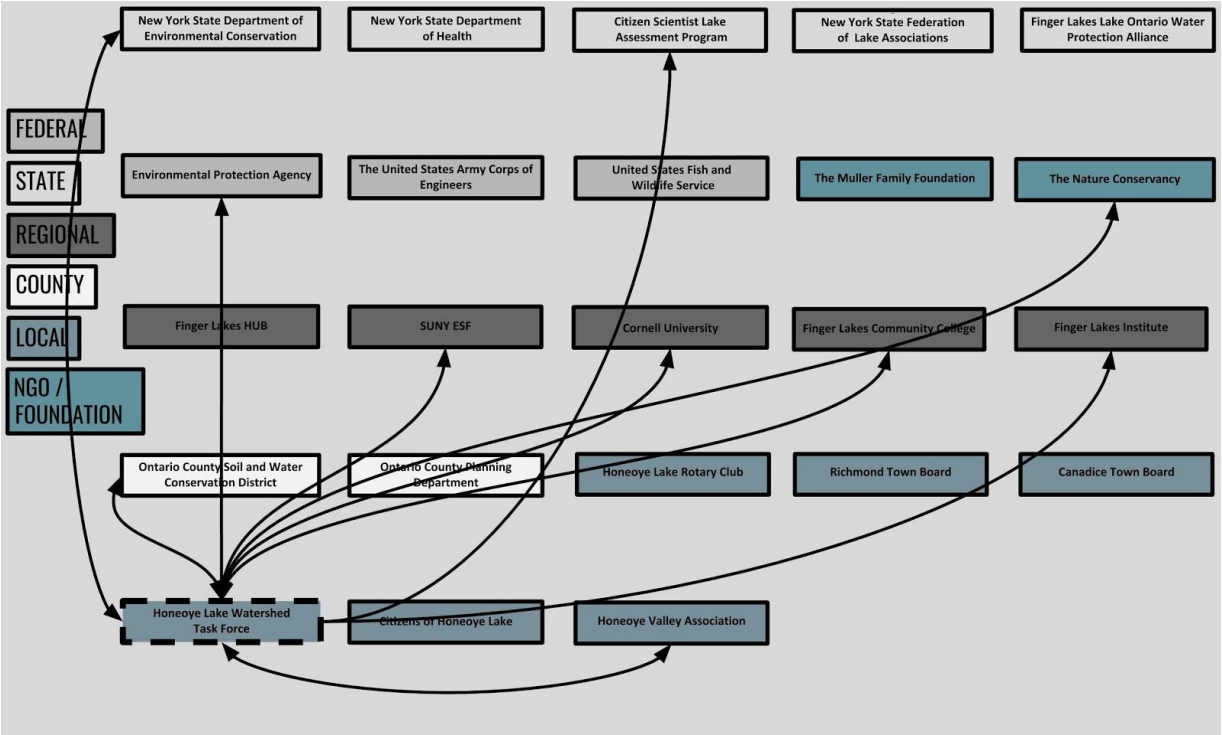


Richmond Town Board's interactions. RTB interacts with:

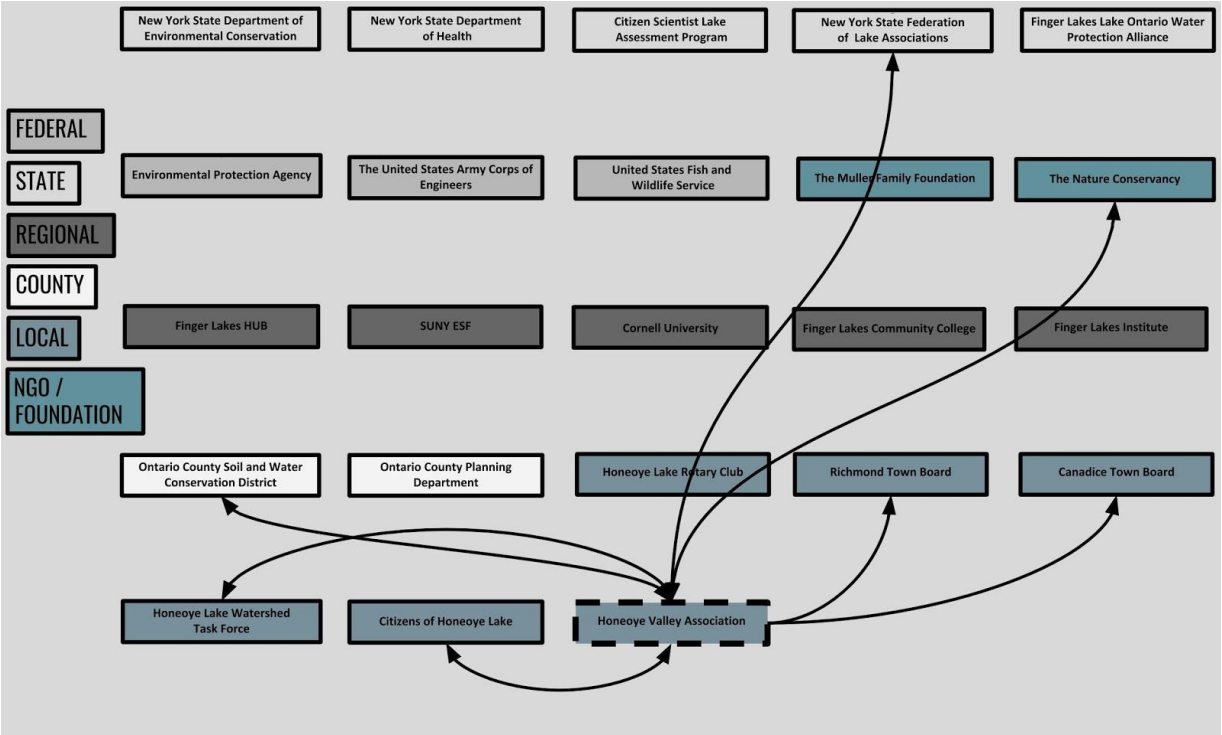
OCSWCD: OCSWCD assists RTB with permitting process and search for funding for town projects, worked with RTB on water control structures to be implemented in the towns (stream bank stabilization on major gullies, vernal pools, basins and inlet control, stormwater retention ponds, stream bank protections, and road culverts) (one-sided relationship)
HVA: HVA facilitates collection of yard waste in Richmond in the fall to prevent trash inflow into the lake and a spring road clean up for RTB (one-sided)



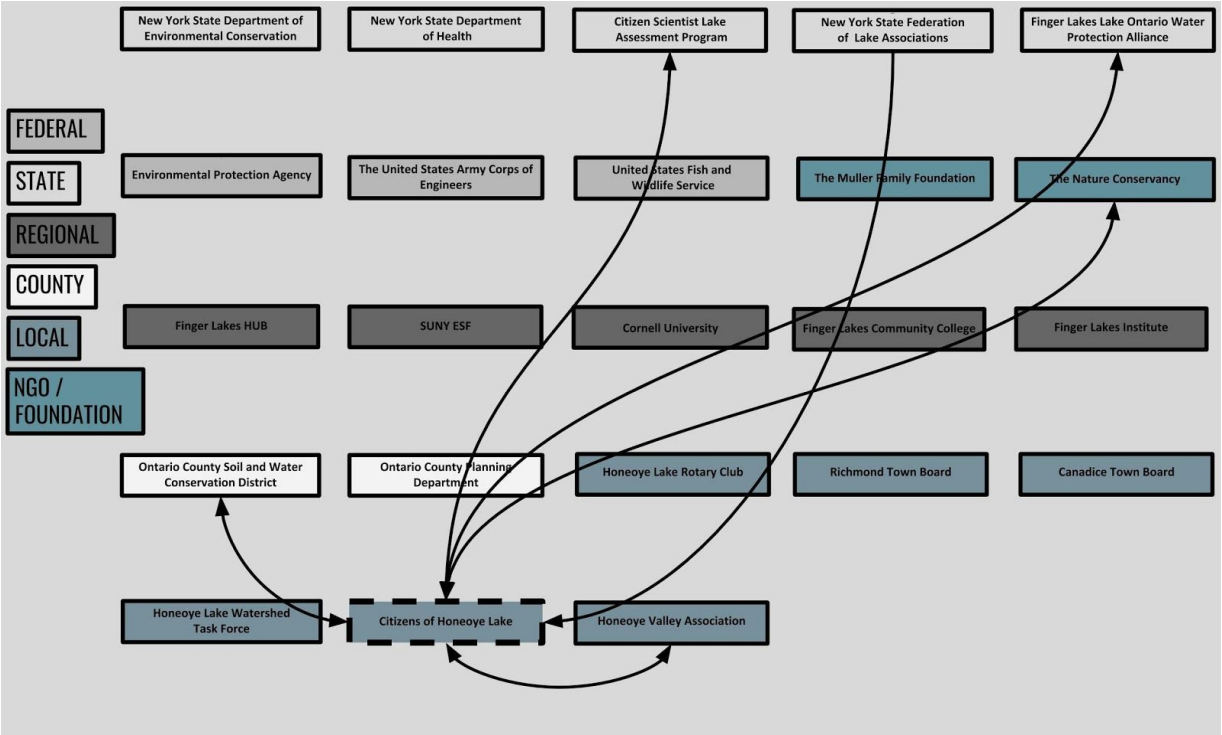
Canadice Town Board's interactions. CTB interacts with:
OCSWCD: OCSWCD assists CTB with permitting process and search for funding for town projects, worked with CTB on water control structures to be implemented in the towns (stream bank stabilization on major gullies, vernal pools, basins and inlet control, stormwater retention ponds, stream bank protections, and road culverts) (one-sided relationship)
HVA: HVA facilitates collection of yard waste in Canadice in the fall to prevent trash inflow into the lake and a spring road clean up for CTB (one-sided)



Honeoye Lake Watershed Task Force's interactions. HLWTF interacts with:
OCSWCD: helps OCSWCD write grant proposals (mutual relationship)
HVA: HLWTF provides information to the concerned citizens that come to HVA with questions (mutual relationship)
FLCC: HLWTF collects and analyzes data on Honeoye to send to FLCC (mutual relationship)
FLI: collects nitrogen data for FLI to analyze (one-sided relationship)
Cornell University: collects and analyzes data with Cornell University (mutual relationship)
CLSAP: HLWTF collects data for CLSAP to use (one-sided relationship)
SUNY ESF: HLWTF takes proactive samples and sends them to Dr. Greg Boyer at SUNY ESF to analyze (mutual relationship)
EPA: advises EPA on watershed modelling (mutual relationship)
NYSDEC: sends NYSDEC basic limnological report weekly (mutual relationship)
TNC: HLWT facilitates meetings between stakeholders for HABs issues that TNC is working on (mutual relationship)



Honeoye Valley Assoicaiton's interactions. HVA interacts with:
OCSWCD: OCSWCD worked with HVA creating grass waterways and water storage sediment control basins to control farm runoff and keep soil where it should be, helped OCSWCD get approval for their inlet restoration project (mutual relationship)
Citizens: HVA publishes a lake-friendly living guide that they send out to all lake residents detailing best management practices, hold symposiums to educate the public and receive feedback on lake programs and projects, communicate to the community the current issues in the lake (mutual relationship)
HLWTF: contacts HLWTF when there is a concerned citizen with questions about the lake, HVA provides HLWTF with volunteers for their projects (mutual relationship)
NYSFOLA: HVA is a member organization of NYSFOLA (mutual relationship)
TNC: helps TNC with labor for their projects, helped TNC get approval for the intet restoration project they were working on with OCSWCD (mutual relationship)
RTB: HVA facilitates collection of yard waste in Richmond in the fall to prevent trash inflow into the lake and a spring road clean up for RTB (one-sided)
CTB: HVA facilitates collection of yard waste in Canadice in the fall to prevent trash inflow into the lake and a spring road clean up for CTB (one-sided)



Honeoye Lake Citizens' interactions. The citizens interact with:
CSLAP: citizens volunteer to collect data for CSLAP (mutual relationship)
OCSWCD: citizens volunteer for OCSWCD's projects (mutual relationship)
HVA: volunteer for HVA's programs, give HVA feedback on programs and projects in the lake, many citizens are members of HVA and attend HVA's meetings (mutual relationship)
TNC: citizens donate money to TNC, volunteer to help with TNC's projects (mutual relationship)
NYSFOLA: NYSFOLA provides public education on lake and watershed management (one-sided relationship)
FLLOWPA: contribute to FLLOWPA's educational workshops with feedback (mutual relationship)